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THE UNITED NATIONS ATOMIC ENERGY COMMISSION

An Historical Survey of the Period June 1946 to March 1947

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PREFACE

This number of *International Conciliation* continues the documentary history of the United Nations Atomic Energy Commission of which the first phase was outlined in *International Conciliation* No. 423, September, 1946. An introduction to the Document has been prepared under the direction of Dr. James T. Shotwell, Chairman of the Carnegie Endowment Committee on Atomic Energy. The documents and statements are reprinted from publications of the United Nations.

NICHOLAS MURRAY BUTLER
President Emeritus

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THE ATOMIC ENERGY COMMISSION
JUNE 14, 1946 TO MARCH 10, 1947

The history of the United Nations Atomic Energy Commission to the first week of March may be divided into seven more or less well defined phases. In the first phase, in June 1946, the twelve representatives of the States members of the Commission formally announced the initial policies of their governments. The second phase consisted of a brief inquiry by Subcommittee No. 1 into certain political questions, in early July. The third phase, in late July and early August, examined further political aspects in Committee 2. The fourth phase was the preparation of a report by the Scientific and Technical Committee, during August and September. The fifth phase, which lasted from October until mid-December, was the period of informal studies resulting in the "First Report on Safeguards." The sixth phase was the preparation of the First Report to the Security Council, projected in mid-November and concluded on December 30, and marked by a return to political principles. The seventh phase was the discussion in the Security Council, beginning on February 4, concerning the jurisdiction of the Commission and the contents of its First Report.

Phase 1: Statements of Policy

The opening meetings of the Commission were devoted to the formal statements of policy of each of the representatives.[1] On June 14, Mr. Baruch set forth, with a ringing appeal to humanity, the United States proposals. At the following meeting, on June 19, Canada welcomed this approach, supported these principles, and accepted the plan as a basis for discussion. The United Kingdom, with exemplary diplomatic caution, welcomed Mr. Baruch's statement; felt gratitude for the provision of a broad and constructive basis for work; endorsed the emphasis on the need for condign, immediate, and effective punishment and was glad to take the scheme as a basis for consideration. Mr. Gromyko then put forward the proposals of the Soviet Union. Following him, Dr.

1 Published in *International Conciliation*, No. 423, September, 1946.

Quo, on behalf of China, welcomed the United States proposals as a basis for deliberations. Brazil gave full approval to the United States plan. Finally, Mexico voiced general approval of Mr. Baruch's proposals, with reservations on the subject of ore deposits.

When the Commission convened next, a week later, M. Parodi set the keynote for the French attitude: in a lengthy address he balanced, contrasted, and sought to harmonize the plans of the Soviet Union and the United States; while supporting the latter plan in broad principle, he thought it was neither necessary nor desirable to take a stand on all questions at the outset. Dr. Lange of Poland then found common ground in the two sets of proposals; though he endorsed the attitude of the Soviet Union, his statement was directed "to the promotion of cooperation among major powers." Dr. van Kleffens pledged the Netherlands to the success of the Commission and considered that the two plans together furnished an adequate starting point for constructive work. Egypt agreed in principle with the United States proposals. Australia's views corresponded broadly with the United States proposals, and Dr. Evatt gave an extensive presentation of their theses upon international control.

The record does not show whole-hearted support for the United States formula. What is revealed is strong support for the principle that an effective system of safeguards is basic to a successful plan, and a general desire to examine the implications of the far-reaching proposal for an international authority. It is true that ten out of twelve States favored in varying degrees the United States proposals above those of the Soviet Union. The Baruch plan had far more potentialities than legal formulae dependent upon mutual interest: the possibility of a treaty that might be largely "self-enforcing" was not to be overlooked. Consequently, the majority wished to discuss it. This was particularly true as the alternative, the Soviet Draft Convention, was a solution in the traditional diplomatic style which apparently offered no international guarantees beyond those existing in the Charter of the United Nations.

The Baruch proposals were accepted in December, not because of their authorship, not because they emanated from the State with the greatest knowledge of atomic energy, not because of any coalition to oppose the Soviet Union, but because they offered the

best hope of security against atomic catastrophe, that could be discerned in the current state of international relations. Nevertheless, there was, from the very first, a diplomatic caution in this support, which was not mirrored altogether accurately in the press of the United States. Indeed there was little coverage of various qualifications put forward, which indicated a reluctance, on the part of some of those who supported the principles of the Baruch proposals, to accept all of its details. The obvious solution for this problem was to move from the generalities to the details. This step was taken in October, when the Commission began its study of safeguards.

Foremost among the political problems which blocked agreement was that of the "veto," a question really less of control than of the restoration of control after its breakdown. It was not until December 27 that Mr. Baruch gave the Commission a full and meticulous analysis of the United States position. His treatment then of the "four facets" of the veto power is lucid, reasoned, coherent, and difficult to counter. That the exact intentions in this regard were for many weeks largely implicit, offered piecemeal, or presented outside the Commission, did not lessen the opportunities of a determined opponent to confuse the issue.

The British Foreign Office has become proverbial for the adroitness with which it can approach a delicate situation. The perspicacious periphrases to which Sir Alexander Cadogan resorted, in avoiding the veto in his opening speech on June 19 are an example of such an approach. He voiced the feeling of His Majesty's Government that there should be "condign, immediate, and effective penalties against violation" and that punishment should be "inevitable and overwhelming."

Sir Alexander Cadogan stressed the end in view. Mr. Baruch laid emphasis on a means to that end. Indeed, it was not until February 14, 1947, that clear recognition was given by the United States that elimination of the veto in matters atomic is not an end in itself. Then Senator Austin said, in reply to Mr. Gromyko's lengthy statement[2] criticizing the United States proposals:

Mr. President, this is a very significant statement, and seems to narrow

[2] Extracts from the text are published on pp. 273–9.

the field of question down to one of law. It does not apparently raise any question of policy, and raises only a question of law; that is, whether effective and enforceable safeguards against the use of atomic energy for destructive purposes can be established within the four corners of the Constitution or Charter of the United Nations, and without depending solely on the Security Council for enforcement.

. . . . . .

The general tone of this able speech, I think, encourages us to believe that on the policy of enforcement we are agreed; namely, that there must be effective and enforceable safeguards against the use of atomic energy for destructive purposes established.

These words do not merely represent debating skill nurtured upon the floor of the Senate. Something along these lines needed to be said at some point before any rapprochement on the subject of violations and sanctions between the United States and the U.S.S.R. could materialize.

The other major point—perhaps the more important one—that at once became an issue was the proposal for control and inspection through an international authority. Because of changed circumstances, Soviet opposition was to be expected in spite of the radical disarmament convention that had been urged by them in 1928, with its provisions for a Permanent International Commission of Control with wide powers for investigation. The Soviet Union has rarely proved itself more altruistic than other States and the condition of its own defenses, armaments, armed forces and industrial potential twenty years ago suggested that, as a matter of expediency, it would be simpler to persuade others to reduce their advantages than for the Soviet Union to overtake them.

The difficulty in the Commission may well have arisen less from the basic principle of international control and inspection, which indeed Mr. Molotov advocated strongly at the General Assembly, than from the extensive power advocated for the international authority. The United States proposed "the creation of an International Atomic Development Authority." The first "fundamental feature" was that "the Authority should set up a thorough plan for control of the field of atomic energy."[3] And presumably,

[3] Quotations from Mr. Baruch, June 19, 1946.

after the elimination of the veto, the thorough plan would be established by a majority decision. In the circumstances, an adverse reaction from the power leading the minority was not unpredictable.

The Soviet Government's distrust of the motives of the outside world is rooted deep in the attempts made for its overthrow by force of arms in its early years and the long diplomatic boycott that followed. In particular, international machinery devised in the West is suspect. The League of Nations was long shunned and neutrality measures taken to counteract its policies of collective security. Even the wartime alliance and the meetings of the Big Three appear to have been marred by suspicions.

There was no extensive catering to these historic prejudices in the drafting of the Baruch proposals. There was little room for doubt that the proposals aimed at rendering obsolescent the theory of international relations based on the traditional doctrine of sovereignty and ushering in an era of intervention, the exact extent of which was unclear, as was also the influence the minority could have in devising the control plan. Pending clarification, a natural minority policy was determined opposition. Mr. Gromyko gave it.

Phase 2: Committee Work Begins

The decision to advance the Commission's program in committee was taken at the third meeting on June 25. Proposals for committees to be formed had been made by Mr. Gromyko and a method of work had been suggested by M. Parodi in their opening addresses. Then Dr. Evatt, who as Chairman, had spoken last, submitted further ideas and out of the debate there arose agreement to form a Working Committee with such broad powers that it was substantially the Commission in closed session.

There then began a period which can be better described as intensive rather than as productive. In the course of half a dozen meetings, totaling some twelve hours, compressed within the compass of a fortnight, a wide variety of subjects were touched upon, some of them on more than one occasion, but none of them with any great thoroughness.

The records show that in Subcommittee No. 1, a creature of

the Working Committee, Mr. Gromyko several times tried to persuade the group to discuss his Convention. However, in general, the subcommittee dealt with the United States proposals: the relations of the proposed Atomic Development Authority with the United Nations; the necessity for an enabling treaty to establish the Authority; jurisdiction over the control measures; violations and sanctions; the stages of transition to final control; the veto; functions and powers of the proposed Authority; continuation of the production of atomic weapons; the value of Article 51 of the Charter as emergency machinery in dealing with violations; the power of the Security Council to predetermine violations and sanctions. A number of extensive papers were submitted, notably three United States memoranda[4] enlarging upon the original proposals. These and other important matters were all glanced at, but the pace attempted was rather ambitious.

The very variety of the topics surveyed gives an indication of what the original purpose of the subcommittee had been. It was set up by the Working Committee on June 28 to examine the various proposals and statements made in the Commission, select the main items and put them up to the Working Committee in an orderly manner to facilitate discussion. The group consisted of the representatives of France, Mexico, the Soviet Union, the United Kingdom, and the United States, under Australian chairmanship.

In his opening remarks to the subcommittee, the Chairman said he conceived the main object was to bring into focus the issues dividing the representatives. In this purpose they were eminently successful. Less well-defined, however, remained the issues upon which agreement existed.

There had been an attempt made to analyze the points of agreement in a chart submitted by the United States delegation to the Working Committee. Taking the opening statements of all representatives, their stand on some twenty important points had been assessed. This chart was a somewhat rigid framework, for it resulted in "yes" appearing opposite particular points when a

[4] Published in *International Conciliation*, No. 423, September, 1946.

representative might merely have advocated the United States proposals as a basis for discussion. Not all were happy at being thus committed. Nevertheless, the chart was indicative and undoubtedly conveyed the correct general impression. But as a summary of the points of agreement between the two main camps it was a little over-terse. And it was not put to practical use as a guide to discussion.

All in all, the work of Subcommittee No. 1, was not an unqualified success. Although it added new material, it dealt mainly with the United States proposals. It did not succeed in clarifying such fundamental points as the method of drawing up the plan for international control. This is another matter that gradually became clear in the course of the negotiations, but like the veto, was not clearly announced in the Commission until many weeks had gone by—not until Mr. Baruch's proposals of December 5, amplified by his speech on December 27. These later pronouncements may, of course, represent a shifting of emphasis that developed gradually within the United States policy, but it does seem from the examination of United States Memoranda 1 and 2, submitted in July, that the intention even then was to have the control plan prepared in considerable detail by the Commission and submitted to the Security Council for approval, rather than leave the planning to the Authority.

Another subject of prime importance, that might advisedly have been enlarged upon at the early stages, is a system of restrictions upon the proposed Authority. There are hints: in Mr. Baruch's opening address there is one obscure reference to "limitations" of the Authority; in Memorandum No. 1, there is a reference to "accountability" and "procedure for review"; in Memorandum No. 3, there are references to "reports" to the Assembly and Security Council, legal relations with the International Court of Justice and a suggestion that some decisions of the Authority regarding sanctions "might be subject to review." However, in their contexts, none of these references convey a strong impression of any intention to incorporate in the plan a system of checks and balances to guard against the misuse of power.

Again this is a matter which only evolved slowly. It appears to

have been brought to the fore during the preparation of the "First Report on Safeguards" released December 31. There the matter is touched upon in the General Introduction and dealt with specifically in Chapter 6, "Detection of Clandestine Activities," where it is stated "throughout this chapter of the report we shall not always state, but shall always assume, that adequate restraints have been provided against the abuse by the international control agency of the wide powers which it must necessarily be given." Again, the first Finding of that Chapter reads:

The right of authorized personnel of the international control agency to direct access and inspection, subject to appropriate restraints, and the right to travel without restraint, is essential in the detection of clandestine activities.

Direct inspection is the most reliable means of detecting clandestine activities; hence, the right of inspection wherever suspicion exists constitutes an important safeguard. It would in general be necessary to require that demonstrable grounds for suspicion exist as a justification for inspection and to establish reasonable legal procedures for the regulation of inspection. The procedures must not delay legitimate access by the international control agency. . . .

It is, of course, possible that these restrictions later agreed upon were not originally contemplated. There is, indeed, a great deal of emphasis laid upon the autonomy that the Authority should have, in the United States Memoranda and in the discussions of Subcommittee No. 1. The constitutional tradition of the United States suggests, however, that such provisions would have been introduced sooner or later. Their inclusion at the outset might have served to reduce or even nullify many objections to the proposed Authority.

Phase 3: Committee 2, July and August

As Chairman of Subcommittee No. 1, Dr. Evatt made a report to the Working Committee on 12 July upon the results of the five meetings. His report includes a useful summing up of the political divergencies and in particular he selected three as being of prime significance:

(a) whether it was desirable to negotiate a convention dealing solely with the "outlawing" of atomic weapons or whether the obligation not to make or use such weapons should be within the framework of a general

plan, an essential part of which should be an effective system of controls to insure use of atomic energy only for peaceful purposes;

(b) the general type of international controls and measures necessary for inclusion within the framework of a general plan; and

(c) the relationship between organized measures for the international control of atomic energy and the United Nations.

This Report was generally well received, not only for the clear analysis of substantive matters it contained but also for the suggestions included for a revised system of committees. However, Dr. Evatt still held the theory that it would make for more rapid progress if the proposed subordinate committees were kept as small as possible. In Subcommittee No. 1, however, the States not represented at first wished to attend as observers and later pressed for more vocal representation as the group began to deal with important matters of substance. After this early experience there was a strong move for unrestricted committees—perhaps giving smaller groups specific tasks such as drafting a preliminary text—and all committees established since then have been of the whole.

Dr. Evatt seems to have considered the problem before the Commission to be quite simple and straightforward. He looked forward to clearing up all its work and presenting the proposals and recommendations, called for in the Commission's terms of reference, to the Security Council in time for them to go before the Assembly, then scheduled for September. This prospective deadline he set himself, and his zeal, in any event, for the quick solution of political differences, no doubt contributed to the pace at which he drove the subcommittee and his impatience in discussing procedural matters. So in the discussion upon the creation of committees, his chairmanship was so forceful that his purpose seemed to be to dominate rather than serve the Working Committee.

Less sanguine over the prospects of an early satisfactory settlement was a growing group who had a somewhat different appreciation of the magnitude of the problem. Their counsel was *festina lente*. They tended to favor the instruction given the Commission "to inquire into all phases of the problem." And there was a sentiment that care and attention to planning the approach would later at least counterbalance any apparent loss of time.

After a sometimes acrimonious debate, three committees were created: Legal Advisory, Scientific and Technical, and what for lack of agreement as to title was dubbed Committee 2. The last-named had these broad terms of reference:

> 1. To examine questions associated with the control of atomic energy activities, including all measures designed to insure the prevention of the use of atomic energy for purposes of destruction and other weapons of mass destruction, and also including the subject matter of possible conventions, sanctions and observance; and
> 2. to make specific recommendations on the said subjects.

Committee 2, in short, took over the principal problems. At its first meeting on July 17, it agreed to deal with three questions initially: the establishment of an Atomic Development Authority, the Soviet Draft Convention, and a list of topics falling within the purview of the committee—and to deal with them in that order. Indeed a clear understanding was reached, at the instance of the French, that the Convention would not be considered until the question of the Authority had been exhausted. There was considerable promise of an opportunity available for a clear and full exposition of the proposed Atomic Development Authority and an unhurried examination and discussion of the three United States Memoranda, which had been submitted in rapid succession and had only received cursory attention.

The next meeting, a week later, served to reveal an unexplained change of heart. The first item discussed was the schedule of topics, and an agreement to submit amendments and revisions to this document was reached. Mr. Gromyko then, rather surprisingly, had some trouble in gaining an audience for some observations he wished to make upon United States Memorandum No. 3—a paper that had not been discussed at all.

The remaining meetings were devoted ostensibly to the discussion of the Soviet Draft Convention. However, after Mr. Gromyko had elaborated his proposals—not greatly clarifying them—in the general debate that followed, a wide variety of basic principles were given consideration. It soon became abundantly clear that the Soviet Union and the rest were at variance in several fundamental respects.

In particular, Mr. Gromyko sought, through the signing of a convention, to secure immediate legal assurances against the manufacture and use of atomic bombs. He maintained that a system of safeguards to insure the fulfilment of the obligations was not an immediate necessity but could be considered later. He further took the view that the Security Council was competent to insure such fulfilment, through the power to impose sanctions. He held that the importance of international inspection had been exaggerated and opposed it as a derogation of national sovereignty. And he repeated that the United States proposals were based upon principles at variance with the Charter of the United Nations, and were unacceptable to the Soviet Union either as a whole or in their separate parts.

Mr. Gromyko seems to have indulged fully in the luxury of being a firmly entrenched minority with little prospect of securing the acceptance of his own policies. Attempts to have him enlarge upon his proposals in any detail met with only general statements. His objections to the United States plan were equally vague—his contention was that the Charter was clear on these matters and anyone interested could make their own comparisons to discover the defects. If his purpose was to crystallize the opposition to his policies, he succeeded admirably.

The Netherlands, for instance, had begun by expressing no preference between the original proposals of the United States and the Soviet Union, but merely a desire to examine both and arrive at a suitable solution. However, when Dr. van Kleffens tried to extract from Mr. Gromyko what he had in mind when he referred in his proposals to preventive measures and systems of control and sanctions, he received unsatisfactory answers. Any thought that Mr. Gromyko intended to suggest in the early future an alternative system of safeguards, as demanded by the Commission's terms of reference, disappeared during these meetings of Committee 2. It also appeared unlikely that he was prepared to make any suggestions at all other than the immediate signing of his Convention.

The fruitlessness of the debate upon political principles became increasingly apparent with each meeting of Committee 2. There

was also a tendency to believe that a more exact appreciation of the practical problems involved—particularly by the Soviet Union—would facilitate discussion of the international control system advocated by the United States.

It was the Mexican representative, Dr. Nervo, who first suggested that the question of the practicability of control be referred to the scientists for advice. This means of securing a new basis for discussion commended itself to many of the representatives. Accordingly on July 31 it was determined to request the Scientific and Technical Committee to "present a report on the question of whether effective control of atomic energy is possible, together with an indication of the methods by which the Scientific and Technical Committee considers that effective control can be achieved."

Pending receipt of the report requested from the Scientific and Technical Committee, it was agreed that no great purpose would be served by continuing the political discussion. This does not imply that there had not been much that was profitable in the clarification of ideas during the meetings of Committee 2. Many preliminaries for the final control system were discussed with some thoroughness. Among these were: the need for a comprehensive system of controls and sanctions to be adopted concurrently with any agreement to outlaw atomic weapons; the unavoidability of some abridgment of national sovereignty in any effective control system; the distinction between preventive action to insure against misuse and corrective action to punish a violator; the need for a reliable means for detecting clandestine manufacture of atomic weapons.

Valuable and important as these discussions were, they could not be looked upon as tending to promote agreement. The situation was not bright in outlook, but there was still considerable optimism—or perhaps a reluctance to accept the difficulties of the negotiations. The delegate of China suffered from no illusions, however. Said Dr. Hsia on August 6 at the last meeting before the political recess: "In my humble opinion, if it should take us a whole year to reach agreement on some of the basic issues of the control problem, we would have succeeded beyond all expecta-

tion. Patience and fortitude is also a motto we need in this committee."

Phase 4: The Scientific and Technical Committee

When the Scientific and Technical Committee took up at the end of July its task of preparing a report on whether effective control was possible, it assumed more than a mere technical undertaking. In reality it was being asked to furnish a factual formula from which could be evolved the means for breaking a tight political deadlock. The importance of the report, then, was to be less what it contained than the direction in which it pointed.

The Scientific and Technical Committee had already held a few meetings, and had reached a very important procedural decision. This was, that their discussions would be hampered if at all times the scientists looked upon themselves as official representatives of their various States. They agreed that the examination of physical and engineering problems could not satisfactorily take place in an atmosphere of diplomatic caution. The result was the institution of the informal discussion, in which attitudes, statements, and opinions were not considered politically binding.

This method had already been adopted for their work when the request for a Report on the possibility of effective control was received. The Chairman, Professor Kramers of the Netherlands, saw that a continuation of the informal practices offered the best prospects for producing an early and satisfactory report. Nevertheless, in the beginning, the atmosphere was not easy and the attitude of the Soviet scientists was marked with caution. This, however, was considerably improved by an agreement to eschew all matters political—a course that was rigidly adhered to, as the Report[5] shows. A further step that facilitated freedom of discussion was the total exclusion of the press. Thus there was little or no prospect that anyone would have the occasional incautious word cast in his teeth, either within the Commission or by the press.

It did not take long for all to enter into what they termed "the

[5] Part IV of the Report to the Security Council, p. 207.

philosophy of their task." Dependence was naturally upon the United States for the great bulk of the expert evidence, and top-ranking scientists and technicians were always on hand when required.

Early in the discussions an inevitable problem arose—the requirements of security. The United States had undertaken to furnish all the scientific information essential to understanding its proposals—an undertaking broad in scope. Further, their scientific chief, Dr. Tolman, had let it be known that if additional information was required beyond what had been voluntarily furnished, the requests would be carefully considered. On a few occasions the additional information could not be supplied, but generally the degree of cooperation was entirely satisfactory to all.

It is usual in scientific transactions to suport all new statements by a full description of the experimental processes. Security requirements often did not permit such a procedure, and the orderly minds of the scientists balked a little. However, a formula for overcoming the difficulty was soon reached: use of the phrase "there is no scientific reason for doubting that. . . ."

This solution proved quite adequate during the process of drawing up the Committee's report. When the draft was completed, however, and it came up before a formal meeting for official approval, the drawback became apparent. For when the Soviet delegation gave their approval of the report, they did so with the important reservation that it was understood that parts were "hypothetical and conjectural."

The importance of such a reservation, sufficient to vitiate Soviet concurrence in the most important sections of the report, should never be underestimated in view of the known tactics followed by Soviet diplomats. It remains as a legal loophole, an exit from some unforeseen tight corner. Quite possibly it was the search for this loophole that delayed Soviet approval until September 26, when the rest had been ready to pronounce approval some three weeks earlier. Certainly the objectivity of the report is exemplary and in general it seems quite unexceptionable to the most searching political critic.

That a committee of the Commission could produce a report

that commanded unanimous support in the difficult political atmosphere existing when it began, suggests that their methods have something to commend them. The methods were akin to those usual in science. The Committee did not take a series of conclusions and then seek arguments and facts to support them. They examined the facts, reasoned their consequences, and from them drew their conclusions.

This method of arriving at international agreements has been generally absent from diplomatic practice in the past. Indeed, many treaties, particularly those drawn up at the conclusion of wars, seem deliberately to avoid or to subordinate the treatment of concrete facts at issue and to depend more upon matters only indirectly related to them. This is particularly true when maps are being redrawn.

The scientific method is no longer one that can safely be ignored in drawing up international agreements. The rapidly increasing complexities and interrelation of national economies, the dependence of financial and political stability upon external influences, indicates that the era in which effective settlements can be reached through giving priority to the interests of the major powers is rapidly drawing to a close. The scientific method was also used in the extensive investigations into safeguards, which followed the same pattern of examining facts and seeking the conclusions to be drawn from them. In this quasi-political realm, the indications are that the process was attended with success, although the extent of the Soviet Union's concurrence in this report is not yet clear.

The work of the Scientific and Technical Committee was valuable in a variety of ways besides indicating the value of the scientific method. As a contribution to science, it may well be insignificant. On the other hand, it served to give official status in the Commission to certain fundamental facts that affect the operation of any system of control. Many documents, notably the Smyth report, are far more comprehensive and detailed. But these documents suffer scientifically from the absence of supporting argument and explanation. The process of examining and either approving or rejecting all the statements in a lengthy treatise

like the Smyth report would be a far longer and more complicated process than compiling a few of the essentials. And the acceptance of a wide variety of unauthenticated statements would have no appeal to cautious scientists, of which the Soviet Union is not alone in having ample.

The Report also led the way toward resolving the political deadlock. This was not because it facilitated an immediate political agreement. It did, however, offer a new approach. By indicating the processes involved in the production of nuclear energy and the dangers that a system of control should guard against, the Report pointed clearly to a further practical means of advancing toward the Commission's objective.

Perhaps the most significant point made in the Report is the verdict that "there is an intimate relation between the activities required for peaceful purposes and those leading to the production of atomic weapons; most of the stages needed for the former are also needed for the latter." This thesis is also put more specifically:

> Production of nuclear fuels is the crucial stage in the operations. Both separation plants for the production of uranium enriched in U-235 and the reactors and extraction plants for the production of plutonium or U-233 deliver nuclear fuel, which, under proper conditions, may be used directly for the manufacture of atomic weapons. According to the published statements available to us, the installations necessary for weapon manufacture are relatively small and the time required is relatively short if the necessary high-skilled personnel is available and the procedure is known. If therefore the strictest safeguards are not taken to prevent the material in the installations producing nuclear fuel from being diverted, the danger is extremely serious.

These statements, concurred in even with reservations by the Soviet Union, are a strong counter to the contention that the elimination of atomic weapons alone would furnish the security system required. Nor does it longer seem reasonable to argue that the Security Council could discover in time to take preventive action any attempt to make atomic weapons unless, as a minimum, there were functioning an international system of inspection.

A more general sort of advantage that resulted from the Committee's work was the improved atmosphere in which negotiations were conducted. For the time being, political differences were

buried and all worked together on a common and constructive task.

In general, then, all the work of the Scientific and Technical Committee can be set down on the credit side of the ledger. Although time had been lost, much had been gained during the respite from political discussion. Now, however, a number of important questions arose: did the fresh data on hand warrant an immediate return to political problems? Was the time ripe to seek approval of an Atomic Development Authority?

The answer given to such questions as these was negative. The political method of presenting a solution and adducing facts in its support still offered little prospect of success. The success that had attended the scientific method suggested that, if the conclusions reached were used as a fresh starting point and a new objective were set, a further set of useful, if partial, conclusions might reasonably be expected.

Phase 5: The Study of Safeguards

Continuation of the scientific method commended itself particularly to the representative of Canada, General McNaughton. During the two months of political lull, he attended many of the scientific meetings and noted both the trend of thinking and the success of the method. He apparently felt the time was not yet ripe for a return to basic political principles, but that an approach to politics would soon have to be made. He proceeded accordingly to advocate an exploratory plan, an extension of the scientific and technical conclusions—and the work was not to seek yet not to avoid political implications.

General McNaughton spent a good many days expounding its merits to each individual representative. This gave him an opportunity of modifying the detail of his plans in accordance with their suggestions and making certain that all were fully acquainted with the intention. As a consequence, when his proposal was formally put to Committee 2 on October 8, the criticism it met with was entirely constructive.

The resolution then passed puts the proposal very succinctly:

> That Committee 2 proceed to examine and report on the safeguards

required at each stage in the production and use of atomic energy for peaceful purposes to prevent the possibilities of misuse indicated in the Report of the Scientific and Technical Committee; that the Committee may hold informal meetings as it may decide, at which scientific representatives may take part in the discussions.

The intention was to study types of safeguards necessary to prevent diversion at various stages in the production of atomic energy; then means to detect and prevent clandestine operations; and finally to consider measures to forestall seizure of plants. The program was based upon the Scientific and Technical Report, which set forth the following sequence of activities:

1. Uranium and thorium mines.
2. Concentration plants.
3. Refineries.
4. Chemical and metallurgical plants.
5. Primary reactors and associated chemical separation plants.
6. Isotope separation plants.
7. Secondary reactors.

There began as a result a steady and highly intensive period of productive work which might still be continuing had it not been interrupted by circumstances at the end of the year. Again, informality was introduced to facilitate the exchange of views and the "conversations" took place on the average twice a week. By a fiction devised by Mr. Baruch's associate, Mr. Hancock, these conversations in theory consisted of the Chairman, assisted by the Secretary, consulting experts on behalf of Committee 2 with any interested persons present. In practice, almost all delegations were always represented and took an active part in the questioning of the experts.

The "conversations" thus opened in auspicious circumstances. The initial problem to be considered was the safeguards required to prevent diversion from mines and somewhat as a surprise, the first contribution to the discussion came from Professor Alexandrov, one of the Soviet Union's foremost geologists. He spoke neither at great length nor in any detail, but only in general terms of mining practices, with some reference to the control system in the Soviet Union. His remarks included the value of surveys of

natural resources to facilitate planning and control of production—an important feature of the Soviet economic system. The co-operative atmosphere was somewhat marred by the manner in which the press seized upon Professor Alexandrov's remarks and read into them a Soviet proposal for a world survey of uranium.

While Professor Alexandrov's statement was not of great factual value, it was a welcome sign of cooperation in the agreed program, and was hardly less constructive than the Searls evidence on the same subject. The latter, which has since been published by the United States delegation, consists mainly of proposals or general statements and is devoted to advocating a particular plan, a process not entirely in keeping with the program of the Committee, which was to examine the facts and draw its own conclusions.

The findings upon raw materials—the Chapter on Mines and Mills in the "First Report on Safeguards"[6]—seemingly draw little either from Professor Alexandrov or Mr. Searls. However, there was a further expert heard, C. S. Parsons of the Canadian Bureau of Mines, who spoke on the procedures and methods used at the Great Bear Lake uranium mine. Presumably the factual background for the Report was drawn largely from his evidence which appears to have been unspectacular and objective—suitable material for the Committee to work with.

In addition to hearing experts, the Committee had laid before it a number of technical documents, provided in the main by the United States delegation. Among these, on the subject of raw materials, was the Report on the Control of Radioactive Minerals published by the Carnegie Endowment. The influence that this exerted upon the findings of the Committee can readily be seen by a comparison of the two sets of conclusions. The Committee's findings are very close to the Carnegie proposals.

The "First Report on Safeguards" contains in other chapters also a number of differences from the policies advocated by the United States. These are merely questions of degree, however, and are not fundamental. Thus the Report finds that inspection by

[6] See p. 232.

itself will largely provide adequate safeguards during the early processes of production—up to the stages where pure uranium and thorium or their compounds appear. Supervision is added with some hesitancy where additional safeguards may be needed. Management is only introduced as a last resort. Ownership of neither materials nor plants is advocated. Less discretion for the control agency is contemplated and specific restrictions are introduced. The Report gives the impression of having sought an effective minimum of control while the United States plan tended to overinsure. However, the Findings of the Report are meant to be indicative rather than definitive, as the Introduction notes, and are subject to revision, presumably in either direction.

The Committee's methods over a period of some two months were such as to permit examination of evidence and documents in an atmosphere that was constructive and to assure findings acceptable to all. A series of important results arose from this situation: (1) the Committee was arriving at findings parallel to the United States proposals, proceeding by independent means, (2) it followed that the principles underlying the United States policy regarding the system of control could be presumed the result of an appreciation of the facts, (3) further it was probable that the United States proposals as a whole could bear scrutiny in detail, and while they might be modified it was doubtful whether any change in principle could properly be considered. So while the Committee, by arriving at findings at some variance with the United States proposals, might superficially appear to weaken them, in reality, the process served to strengthen them.

Phase 6: Report to the Security Council

As soon as the studies on safeguards began, it was the practice to sum up the findings appropriate to each stage. Initially these were kept as individual papers, and no definite plan appears to have been evolved for their coordination. Presumably in due course they would have been assembled for consideration by Committee 2, formally as a basis for a system of control. However, after about a month of working, the coordination was supplied as part of a larger idea.

The sixth plenary session of the Commission was held on November 13. At this a proposal was made by the Chairman, Colonel Khalifa of Egypt, that a report should be made to the Security Council at the end of the year—something in the nature of an interim report, including proceedings, findings, and recommendations, based upon the deliberations to date. The ready reply of the United States representative and his immediate request that the matter be put to a vote suggested a degree of close cooperation.

Generally during the postwar period, whether in the Security Council, the Atomic Energy Commission, the General Assembly, the conferences of Foreign Ministers, peace conferences, or their preparatory commissions, the delegates of the Soviet Union have uniformly shown great caution in their approach to a decision, no matter how innocuous the matter at issue may appear to be. Any proposal of sufficient importance to warrant a vote equally warrants "some preliminary study" before voting. The more complicated the proposal the greater is the need for careful scrutiny to insure both that the text states what is intended and also that it contains no traps for the unwary. It was therefore to be expected that the Soviet representative would wish to have time to study a proposal for a report which, although possibly based upon technical matters, might deal as well with political issues. The proposal dealt moreover with the nature of the contents, method of preparation, and dates of submission of the report. Furthermore, Professor Alexandrov was in the Soviet chair, and was unlikely to exercise any less caution than would have Mr. Gromyko.

The representatives of France and the Netherlands both made efforts to reassure Professor Alexandrov that the proposal had no far-reaching implications by emphasizing that the report would be of an interim character only. It appears from their statements, however, that they were giving their own interpretations of the meaning of the proposals and had had no more advance notice than the Soviet Union. Had their lead been followed up and the intent and limitations of the proposals been debated into a state of crystal clarity, the abstention of the Soviet Union might have been avoided. Or as an equally simple course, the taking of a decision could have been postponed. The result of taking an im-

mediate vote in which the Soviet representative abstained was to relieve him not only of the opprobrium of opposing an eminently reasonable proposal, but also of the responsibility for the decision. He was in a position later to point out that the Soviet Union had never given any support to the idea of making any report, should such a course be expedient. Thus, when the deadline date approached, the Soviet Union ceased its collaboration and adopted a policy of "nonparticipation," first in Committee 2 on December 18 and 19, in the consideration of the documents in their final drafts and their assembly, and then on December 30 in the Commission itself. Having refrained from approving the dates for submission of the report, it pointedly refrained from the formal discussions. This might have occurred anyway, but the Soviet Union would in that case have had to adduce other reasons for avoiding commitment to the procedures and deadlines.

The decision to submit a report to the Security Council gave a slightly different direction to the study of safeguards. After mid-November, there was a conscious effort at drafting the findings for each stage in the production of atomic energy, into a form suitable for inclusion in such a report. The discussions accordingly became twofold in character: in addition to hearing expert evidence and reasoning forward to conclusions, the committee was concerned with drafting. Thus there gradually took shape the "First Report on Safeguards."

Return to Political Issues

M. Parodi, who was then Chairman of the Commission, called the seventh plenary session on December 5 to discuss the relation of the work of the General Assembly, then discussing disarmament, with that of the Commission. It was his view that the Assembly should be requested not to prejudge the work of the Commission and to refrain from taking any action which would alter or limit its program—a view which carried the support of the Commission.

Mr. Baruch took advantage of this meeting to put forward proposals which were in substance a restatement of the principles he had advocated some six months previously. They took into

account, however, the intervening events and so a few modifications of detail appear. He could with certainty count upon the support of the great majority of the Commission. Moreover, external affairs, in the General Assembly particularly, suggested that much that had previously been opposed by the Soviet Union could now reasonably expect support from the same quarter.

While the situation was in many ways propitious, there was an important tactical decision to be made. The value of ample advance notice of the proposals had to be weighed against the advantages of delaying to await the final results of the Assembly concerning armaments and atomic energy control. The decision to make the proposals known at an early date was probably the sounder choice. The strength of the presentation might have been reinforced, however, by an announcement that the proposals were indicative rather than definitive in those matters upon which the Assembly had not yet arrived at final conclusions. Such a provision would have eliminated any possible accusation that the United States was pursuing two policies on the same subject simultaneously. It also might well have served to draw from Mr. Gromyko, then in December rather than later in February, a more constructive line of criticism directed toward securing conformity between the Commission's recommendations and the Assembly's resolution.

In the event, the principal question which Mr. Gromyko permitted himself to discuss in the Commission's debates between December 17 and 30, was the "veto." He did deal, but only superficially, with one or two other matters of a minor nature. The main endeavors to secure conformity with the Assembly resolution were made by those States which approved and supported the Baruch principles.

In the interval between December 5 and 17, when the Baruch proposals were again on the Commission agenda, examination of them had suggested that a number of changes were desirable. Some of these arose out of the Assembly Resolution on disarmament, which was not passed until December 14. Others were based upon the other material earmarked for inclusion in the Report to the Security Council. There resulted some general

criticism of the proposals during that meeting, and at the next, on December 20, General McNaughton brought in an amendment. This had as its purpose the approval of the principles of the United States proposals, and the transmission of the proposals to committee for redrafting and inclusion in the Report to the Security Council.

In addition to trying thus to have the Soviet Union discuss and put forward their objections to the Baruch proposals in time to allow the production of an unanimous report, General McNaughton also submitted an extensive memorandum of proposed changes. Unfortunately, the Soviet representative again adopted a policy of "nonparticipation" in the process of amendment and merely expressed general disapproval. It remained for the other States to seek conformity with the Assembly resolution.

While the United States remained firm in resisting changes in the proposals, it became evident that some other States were inclined to accept compromise in the manner of presentation, and to some extent on matters of detail. In general terms, these States appeared to have three basic views: first of all, they concurred in the principles of the United States proposals; secondly, they believed that, while the Commission might elaborate the basic tenets unanimously approved by the Assembly, it was not a suitable time to be at variance with such tenets; thirdly, they maintained that unanimity was preferable to a majority solution and that some controversial questions which had not yet been fully discussed might be postponed with advantage. Perhaps the most succint statement of this trend of thinking was made by General McNaughton on December 30 when explaining the Canadian attitude toward the Report to the Security Council.[7]

This brought to the fore the whole question of the advisability of making a further assault on the veto at that juncture. The question was apposite, for it had come before the Assembly only a few days before and the decision had been reached to make no changes in that Article of the Charter. In the circumstances, there were some who doubted that, in spite of agreement with the

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7 See p. 271.

remaining recommendations in the Commission's Report, there would be enough support to carry the proposals regarding the veto. On the other hand, Mr. Baruch was in no position to accept what would look like a compromise on an essential point in his proposals. For the omission of reference to the veto would have been interpreted by sections of the American press as a withdrawal by him from a position with which he had become identified.

The separation of the veto issue from the remainder was urged by Dr. van Kleffens without avail. In addition, a number of endeavors were made to modify the phraseology to a less controversial form. That this latter course would not have met with any success was, however, made clear by Mr. Gromyko.

The whole question of tactics again emerged as being of major importance. The issue here was whether the probability of reaching an intermediate objective offered a more attractive course than the remote possibility of going the full distance at once. Several States manifestly favored the former alternative and only accepted the latter because of the firmness of the United States, which found its final expression in Mr. Baruch's statement:

> Gentlemen, it is either—or. Either you agree that a criminal should have this right by voting against our position (or you fail to take a stand on the question by refraining from voting), or you vote for this sound and basic principle of enduring justice and plain common sense.

There is evidence in several places in the December debates of the Commission that several of the representatives held views differing somewhat from those of the United States as to the most promising strategy. France and Canada were strongly in favor of insuring partial success as fully as possible. Dr. van Kleffens, who was also retiring from the Commission, was quite content to have the decision on some principles he considered vital postponed to facilitate other agreements.

The positive results of the final vote in the Commission on the "First Report to the Security Council" are that the report was passed without a dissenting vote, and that ten nations out of twelve are recorded as approving its contents. The advance that

this represents over the situation of the previous summer was that the principles of the United States proposals were now officially endorsed by the great majority of the Commission. The value attached to this situation depends on the extent to which it is believed that majority rule can be effective in international relations.

Phase 7: The Security Council Debates

At the turn of the year, three nations retired from the Commission—Egypt, Mexico, and the Netherlands—and were replaced by the newly elected members of the Security Council—Belgium, Colombia, and Syria. This change in membership would in any circumstances have necessitated a period of slow movement to enable the new representatives to become fully acquainted with the Commission and its methods of work. Certainly there could have been no question of continuing at the intensive level reached at the end of 1946—there were thirty-five official meetings in the last three months.

More important than these foreseen changes was the sudden resignation of Mr. Baruch and his associates on January 4. Washington does not appear to have been any better prepared for this move than the Commission and, with the retirement of Secretary Byrnes, there followed a period of uncertainty, at least in the Commission, as to how the United States delegation would function. For nearly a fortnight, the delegation lacked an official head, until Senator Warren Austin, who had led the United States delegation in the General Assembly, assumed his duties as United States representative at the seat of the United Nations and had the Commission included within his jurisdiction.

The situation that he found was not altogether ideal. After having pushed the Soviet Union for an early decision in atomic energy matters a couple of weeks before in the Commission, the United States in mid-January had in turn to ask for postponement of discussion in the Security Council. Senator Austin met the situation with such a good grace that he had no difficulty in securing support for his request. From the indications he gave in the Security Council, and reading between the lines of his recent

public addresses, it soon appeared that Senator Austin was inclined to de-emphasize points of difference and to seek and secure as much agreement as possible.

In the particular issue of the veto, he gave evidence of a desire to put off controversy for the time being. In speeches at Chicago and to the New York Bar Association, he expounded Articles 1 and 2 of the Charter as obliging collective action against aggression; he examined Article 51 for its value as an emergency measure, and considered the powers of the Assembly under Article 11 in respect of maintaining peace.

At the same time, there was no reason for supposing that he proposed any retreat from any adopted principles. The vigorous and successful battle that he put up to insure the exclusive jurisdiction of the Atomic Energy Commission over questions of atomic energy was ample warranty that when an issue comes to a head, he is tenacious of principle. He showed however, a facility for yielding in matters of phraseology and genuinely disavowed pride of authorship.

After having been in suspense for a month, atomic energy emerged again on February 4 as an active issue in the international forum. To begin with, the major question before the Security Council was one of jurisdiction: whether the proposed new Commission to deal with armaments should also have the power to make recommendations in the field of atomic energy. This question was settled, in favor of exclusive jurisdiction for the Atomic Energy Commission, by a decision of the Council on February 14, Mr. Gromyko alone abstaining from voting.

After disposal of this issue, the "First Report of the Atomic Energy Commission to the Security Council" came under discussion on February 13. General McNaughton, who had been invited to participate in the discussion, at once pressed Mr. Gromyko and the Polish representative to make known in detail their objections to the Report to which they had referred on December 30. On February 14, Mr. Gromyko, in reply, made a general statement[8] of the views of the U.S.S.R. with regard to the

[8] See p. 273.

Report. Basing his criticisms upon the Charter and the Assembly Resolutions of January 24 and December 14, he made as his main points the omission of any recommendation to conclude an early convention prohibiting military use of atomic energy, and the inclusion of the clauses concerned with modifying the principle of unanimity. He also undertook to submit a detailed list of amendments and additions, and did so at the next meeting on February 18.

In general, the amendments proposed by the Soviet Union were by no means so completely negative as were indicated in the current newspaper accounts. From a study of the document it was evident that agreement was still possible in several important areas despite the fact that on such matters as the veto there were continuing divergencies between the Soviet proposals and those of the Commission which had followed the line suggested by the United States. The procedure which was indicated by this situation was that the agreements should be consolidated by a revision of the Commission's report in an appropriate manner in order to arrive at a document which would command unanimous approval.

This was the course which both the United Kingdom and France proposed to follow in the meeting on February 20. It seemed doubtful that there would be any advantage in an intensive debate in the Security Council on what might turn out to be a divergence in drafting rather than in substance. Therefore the trend of the discussion was that the Report together with the proposed amendments be referred back to the Commission with instruction to reconcile the documents wherever possible and to omit those portions upon which an early agreement seemed improbable.

At the following meeting, Mr. Austin presented a draft resolution which would have returned the Report to the Commission together with the record of the Security Council's debates. He provided for no further interim reports and called for an overall draft treaty as soon as possible. The French delegate favored setting a date for a further report within a few months. The Brazilian delegate suggested certain deletions for the sake of brevity and clarity. Mr. Gromyko reserved the right of further

detailed comment, but all were in favor of the general idea of sending the Report back to the Commission without voting on its merits.

Questions of basic principle were not quite finished in the Security Council, however. On March 5, for over an hour Mr. Gromyko reiterated and elaborated his two main theses—the desirability of an early covenant prohibiting atomic weapons and the need to maintain the rule of unanimity—and launched into a new area of criticism.[9] In addition to a strong defense of the veto, which he insisted was chiefly of American origin, he attacked the proposed control agency on the grounds that its activities needed more restrictions than had been proposed; that as projected it could interfere unduly with unrelated industries; that it threatened the economic independence of the minority powers; and that it aimed at establishing a United States monopoly. Mr. Gromyko's objections to the Report were more definite than in any previous statement. The Soviet Union was ready to accept a majority vote only "in appropriate cases" which should not include any activities interfering with the economic life of the country. "The Soviet Union does not wish and cannot allow such a situation." The basis of this decision of the Soviet Union was clearly indicated in the statement that the majority vote in the control organ might be very well one "on whose benevolent attitude toward the Soviet Union the Soviet people cannot count. Therefore the Soviet Union, and probably not only the Soviet Union, cannot allow that the fate of its national economy be handed over to this organ."

Mr. Austin on March 10, in presenting a revised text of his resolution, replied in refutation of these criticisms.[10] Several other representatives also replied to Mr. Gromyko's accusations since they had contributed to, assisted in drafting, and approved the Report. In the end, however, Mr. Gromyko joined with the other members of the Security Council in a unanimous agreement to send the problem back to the Commission accompanied by the

9 Extracts of speech on pp. 280–6.

10 For text of the resolution and extracts of Mr. Austin's speech, see pp. 266 and 287–8.

record of the Council's discussions; to urge the Commission to proceed to formulate specific proposals; and to request a further report before the next General Assembly in September, 1947.

This did not set the Commission back quite to the position it was in when it began its work in June, 1946. There was in sight a limited area of agreement between the First Report and the proposed Soviet amendments. The extent of this agreement, if it were defined and consolidated, might well be sufficient to form a basis for further constructive action. The Report itself indicated some of the questions that still required detailed study, such as the functions, powers, and organization of the control agency.

DOCUMENTS

THE FIRST REPORT OF THE ATOMIC ENERGY COMMISSION TO THE SECURITY COUNCIL

PART II—FINDINGS

A. *Findings on the Scientific and Technical Aspects of the Problem of Control*

The Report of the Scientific and Technical Committee on Scientific and Technical Aspects of the Problem of Control, included in its entirety as PART IV of this report, was accepted by Committee 2 as a basis for its future work. The Commission now records its approval of that report and incorporates in its present findings the conclusions summarized therein in Chapter 6, as follows:

The substances uranium and thorium play a unique role in the domain of atomic energy, since as far as we know these are the only raw materials from which the nuclear fuel required for the development of atomic energy can be obtained. There is an intimate relation between the activities required for peaceful purposes and those leading to the production of atomic weapons; most of the stages which are needed for the former are also needed for the latter. The character of the different stages of the activities has been discussed in order to explore at each stage the elements of danger and to some extent the problem of safeguards against these dangers.

With respect to mining operations, which are of special significance as the first step in these activities, it appears hopeful that safeguards are not too difficult. Particular attention should be paid to the installations in which concentrated nuclear fuel is produced since the product lends itself immediately to the production of bombs. Unless appropriate safeguards are taken at each of these stages, it will be difficult to insure that no diversion of material or installations will take place.

With regard to the question posed by Committee 2, "whether effective control of atomic energy is possible," we do not find any basis in the available scientific facts for supposing that effective control is not technologically feasible. Whether or not it is politically feasible is not discussed or implied in this report, nor is there any recommendation of the particular system or systems by which effective control can be achieved.

B. *Findings on the Safeguards To Insure the Use of Atomic Energy Only for Peaceful Purposes*

The safeguards required at each stage in the production and use of atomic energy for peaceful purposes to prevent the possibilities of misuse indicated in the report of the Scientific and Technical Committee were examined at length in the Informal Conversations of Committee 2. A report on the subject, called the "First Report on Safeguards Required To Insure the Use of Atomic Energy Only for Peaceful Purposes," was duly prepared, has been approved by the Commission, and is incorporated as PART V of this report.

The summary of the findings of that report is given below. (See page 233 for definitions of the types of safeguards mentioned herein.) These findings have led to the important conclusion that an international control agency must be responsible for the system of safeguards and control. They also indicate some of the essential functions of the agency. The specific control measures mentioned in the findings are not meant to be definitive but rather to be indicative of the various types of safeguards applicable at each stage. In devising a definite system of control, provision must be made for flexibility in adapting safeguards to a rapidly developing technology. Moreover, the findings are interrelated and, although the coordination of safeguards is discussed to some extent, further measures of coordination must be considered before formulating a comprehensive system of control. The findings, therefore, do not represent a plan for atomic energy control but only some of the elements which should be incorporated in any complete and effective plan.

SUMMARY OF FINDINGS

1. Safeguards Necessary To Detect and Prevent Diversion from Declared Activities.

(a) Diversion of Uranium from Declared Mines and Mills.

Adequate safeguards against diversion from declared mines and mills are possible by a system of inspection, including guards, similar to normal managerial operating controls, provided that the inspectorate has unrestricted access to all equipment and opera-

tions and has facilities for independent weighing, assay, and analysis.

(b) Diversion of Thorium from Declared Mines and Mills.

Effective control of the raw material and concentrates of thorium is possible through a system of inspection similar to that found adequate for uranium.

(c) Diversion of Uranium and Thorium from Declared Refineries and Chemical and Metallurgical Plants.

Adequate safeguards against diversion from declared refineries and chemical and metallurgical plants are possible by a system of inspection, including guards, similar to normal managerial operating controls, provided that the inspectorate has unrestricted access to all equipment and operations and has facilities for independent weighing, assay, and analysis and provided that it has the right to require the plant to be shut down for purposes of clean-up and accounting at appropriate times and to require efficient operating procedure.

At these stages, there is no fundamental difference between the processes for thorium and for uranium.

(d) Diversion of Uranium from Declared Isotope Separation Plants.

At present, it is not possible to place reliance on the method of obtaining a material balance of uranium isotopes in the case of isotope separation plants. This is one of the important reasons why there must be internal control of such plants by a director or manager and why the management must be established by and be responsible to the international control agency. Even if the material balance could be greatly improved, the inherent danger of the operation would still require management by the international control agency.

(e) Diversion of Uranium, Thorium, and Plutonium from Declared Nuclear Reactors and Associated Chemical Extraction Plants.

(*i*) At present, it is not possible to place reliance on the method of obtaining a material balance of plutonium in the case of reactors and associated chemical extraction plants. This is one of the important reasons why the chemical extraction plants and, in some cases, the reactors should be subject to internal control by a director or manager and why the management must be established by and be responsible to the international control agency. Even if

the material balance could be greatly improved, the inherent danger of the operations would still require management by the international control agency.

(*ii*) The safeguards required for the control of reactors will depend on their size and design and especially on their content and possible rate of production of nuclear fuel. The safeguards available to the international control agency should include licensing and inspection, supervision, and management of the operation of reactors. In addition, close supervision of the design and construction of reactors is essential in all cases.

(*iii*) Periodic inspection, together with licensing, is an adequate safeguard in the case of small research reactors and their associated chemical plants, unless their total content of nuclear fuel or potential rate of output in any area is of military significance.

(*iv*) Adequate safeguards for chemical extraction plants associated with all except small research reactors are only possible through management by the international control agency.

(*v*) Adequate safeguards during the preparation of the high-grade or pure nuclear fuels in a suitable form for insertion in secondary reactors, and, during the storage and shipment of such fuels, are only possible through management by the international control agency.

2. Safeguards Necessary To Insure the Detection of Clandestine Activities.

(a) The international control agency will require broad privileges of movement and inspection, including rights to conduct surveys by ground and air. These privileges should, however, be very carefully defined to insure against misuse.

(b) Reports and returns on relevant matters will be required from national governments.

(c) The international control agency should coordinate all relevant information to determine what areas may be suspected of containing clandestine activities.

(d) Isotope separation plants, reactors, and chemical extraction plants, as well as mines, have distinguishing features which would facilitate the detection of clandestine activities at these stages.

(e) Detection of clandestine refineries and chemical and metallurgical plants is more difficult than detection of clandestine operations at other stages in the processing of nuclear fuel.

(f) The detection of clandestine bomb manufacture as such is almost impossible; it is, therefore, vital that any unauthorized accumulation of essential nuclear fuels be prevented.

3. Seizure.

(a) Problems relating to seizure have been considered thus far only in preliminary terms. The major questions of seizure are political rather than technical. It appears, however, that technical measures could reduce the military advantages and, therefore, the dangers of seizure.

4. Coordination of Safeguards.

(a) In addition to material accounting at each individual step in atomic energy processes, the international control agency should provide for material accounting checks between points of shipment and receipt of material as a means of detecting possible diversion in transit.

(b) The international control agency should control the storage and shipment of uranium and thorium materials to the degree necessary for security purposes.

(c) The international control agency should itself store and itself handle all enriched or pure nuclear fuel in transit. This does not necessarily imply ownership either of the materials or of the transit or storage facilities, questions which have not yet been discussed.

(d) Since stocks of concentrated or pure nuclear fuel are acutely dangerous, operations at successive stages in the production of atomic energy should be so scheduled that stocks of materials in transit and in storage are minimized, but without interfering unduly with the development and effectiveness of peaceful activities.

C. *General Findings*

The findings of the "First Report on Scientific and Technical Aspects of the Problem of Control" and of the "First Report on Safeguards Required To Insure the Use of Atomic Energy Only for Peaceful Purposes," while limited to the more technical aspects of the control of atomic energy, provide a basis for further progress by the Commission toward the fulfilment of the terms of reference set out in the General Assembly Resolution of 24 January 1946, establishing a commission to deal with the problems raised by the

discovery of atomic energy and other related matters. The Resolution of 14 December 1946 of the General Assembly, entitled "Principles Governing the General Regulation and Reduction of Armaments," provides certain broad and essential political agreements. Based upon the proposals and information presented to the Commission, upon the hearings, proceedings, and deliberations of the Commission to date, and upon the proceedings, discussions, and reports of its several committees and subcommittees, all as set forth in this report, the Commission has made the following additional findings of a general nature:

1. That scientifically, technologically, and practically, it is feasible,

(a) to extend among "all nations the exchange of basic scientific information" on atomic energy "for peaceful ends,"[1]

(b) to control "atomic energy to the extent necessary to insure its use only for peaceful purposes,"[1]

(c) to accomplish "the elimination from national armaments of atomic weapons,"[1] and

(d) to provide "effective safeguards by way of inspection and other means to protect complying States against the hazards of violations and evasions."[1]

2. That effective control of atomic energy depends upon effective control of the production and use of uranium, thorium, and their fissionable derivatives. Appropriate mechanisms of control to prevent their unauthorized diversion or clandestine production and use and to reduce the dangers of seizure—including one or more of the following types of safeguards: accounting, inspection, supervision, management, and licensing—must be applied through the various stages of the processes from the time the uranium and thorium ores are severed from the ground to the time they become nuclear fuel and are used. (Cf. "Findings on the Safeguards To Insure the Use of Atomic Energy Only for Peaceful Purposes," PART II B of this report.) Ownership by the international control agency of mines and of ores still in the ground is not to be regarded as mandatory.

3. That whether the ultimate nuclear fuel be destined for peaceful

[1] Commission's terms of reference, Article V, Resolution of the General Assembly, 24 January 1946.

or destructive uses, the productive processes are identical and inseparable up to a very advanced state of manufacture. Thus, the control of atomic energy to insure its use for peaceful purposes, the elimination of atomic weapons from national armaments, and the provision of effective safeguards to protect complying States against the hazards of violations and evasions must be accomplished through a single unified international system of control and inspection designed to carry out all of these related purposes.

4. That the development and use of atomic energy are not essentially matters of domestic concern of the individual nations, but rather have predominantly international implications and repercussions.

5. That an effective system for the control of atomic energy must be international, and must be established by an enforceable multilateral treaty or convention which in turn must be administered and operated by an international organ or agency within the United Nations, possessing adequate powers and properly organized, staffed, and equipped for the purpose.

Only by such an international system of control and inspection can the development and use of atomic energy be freed from nationalistic rivalries with consequent risks to the safety of all peoples. Only by such a system can the benefits of widespread exchange of scientific knowledge and of the peaceful uses of atomic energy be assured. Only such a system of control and inspection would merit and enjoy the confidence of the people of all nations.

6. That international agreement to outlaw the national production, possession, and use of atomic weapons is an essential part of any such international system of control and inspection. An international treaty or convention to this effect, if standing alone, would fail

(a) "to insure" the use of atomic energy "only for peaceful purposes,"[2] and

(b) to provide "for effective safeguards by way of inspection and other means to protect complying States against the hazards of violations and evasions,"[2]

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[2] Commission's terms of reference, Article V, Resolution of the General Assembly, 24 January 1946.

and thus would fail to meet the requirements of the terms of reference of the Commission. To be effective, such agreement must be embodied in a treaty or convention providing for a comprehensive international system of control and inspection and including guarantees and safeguards adequate to insure the carrying out of the terms of the treaty or convention and "to protect complying States against the hazards of violations and evasions."[3]

Part III—Recommendations

Based upon the findings of the Commission set forth in PART II of this report, the Commission makes the following recommendations to the Security Council with respect to certain of the matters covered by the terms of reference of the Commission, which recommendations are interdependent and not severable, embodying the fundamental principles and indicating the basic organizational mechanisms necessary to attain the objectives set forth in PART II C, General Findings, paragraph 1 (a)-(d) above.

1. There should be a strong and comprehensive international system of control and inspection aimed at attaining the objectives set forth in the Commission's terms of reference.

2. Such an international system of control and inspection should be established and its scope and functions defined by a treaty or convention in which all of the nations Members of the United Nations should be entitled to participate on fair and equitable terms.

The international system of control and inspection should become operative only when those Members of the United Nations necessary to assure its success by signing and ratifying the treaty or convention have bound themselves to accept and support it.

Consideration should be given to the matter of participation by non-Members of the United Nations.

3. The treaty or convention should include, among others, provisions

(a) Establishing, in the United Nations, an international con-

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[3] Commission's terms of reference, Article V, Resolution of the General Assembly, 24 January 1946.

trol agency possessing powers and charged with responsibility necessary and appropriate for the prompt and effective discharge of the duties imposed upon it by the terms of the treaty or convention. Its rights, powers, and responsibilities, as well as its relations to the several organs of the United Nations, should be clearly established and defined by the treaty or convention. Such powers should be sufficiently broad and flexible to enable the international control agency to deal with new developments that may hereafter arise in the field of atomic energy. The treaty shall provide that the rule of unanimity of the permanent Members, which in certain circumstances exists in the Security Council, shall have no relation to the work of the international control agency. No government shall possess any right of veto over the fulfilment by the international control agency of the obligations imposed upon it by the treaty nor shall any government have the power, through the exercise of any right of veto or otherwise, to obstruct the course of control or inspection.

The international control agency shall promote among all nations the exchange of basic scientific information on atomic energy for peaceful ends, and shall be responsible for preventing the use of atomic energy for destructive purposes, and for the control of atomic energy to the extent necessary to insure its use only for peaceful purposes.

The international control agency should have positive research and developmental responsibilities in order to remain in the forefront of atomic knowledge so as to render the international control agency more effective in promoting the beneficial uses of atomic energy and in eliminating its destructive ones. The exclusive right to carry on atomic research for destructive purposes should be vested in the international control agency.

Research in nuclear physics having a direct bearing on the use of atomic energy should be subject to appropriate safeguards established by the international control agency in accordance with the treaty or convention. Such safeguards should not interfere with the prosecution of pure scientific research, or the publication of its results, provided no dangerous use or purpose is involved.

Decisions of the international control agency pursuant to the powers conferred upon it by the treaty or convention should govern the operations of national agencies for atomic energy. In carrying out its prescribed functions, however, the international

control agency should interfere as little as necessary with the operations of national agencies for atomic energy, or with the economic plans and the private, corporate, and State relationships in the several countries.

(b) Affording the duly accredited representatives of the international control agency unimpeded rights of ingress, egress, and access for the performance of their inspections and other duties into, from and within the territory of every participating nation, unhindered by national or local authorities.

(c) Prohibiting the manufacture, possession, and use of atomic weapons by all nations parties thereto and by all persons under their jurisdiction.

(d) Providing for the disposal of any existing stocks of atomic weapons and for the proper use of nuclear fuel adaptable for use in weapons.

(e) Specifying the means and methods of determining violations of its terms, setting forth such violations as shall constitute international crimes, and establishing the nature of the measures of enforcement and punishment to be imposed upon persons and upon nations guilty of violating the terms of the treaty or convention.

The judicial or other processes for determination of violations of the treaty or convention, and of punishments therefor, should be swift and certain. Serious violations of the treaty shall be reported immediately by the international control agency to the nations parties to the treaty, to the General Assembly and to the Security Council. Once the violations constituting international crimes have been defined and the measures of enforcement and punishment therefor agreed to in the treaty or convention, there shall be no legal right, by veto or otherwise, whereby a willful violator of the terms of the treaty or convention shall be protected from the consequences of violation of its terms.

The enforcement and punishment provisions of the treaty or convention would be ineffectual if, in any such situations, they could be rendered nugatory by the veto of a State which had voluntarily signed the treaty.

4. In consideration of the problem of violation of the terms of the treaty or convention, it should also be borne in mind that a violation might be of so grave a character as to give rise to the inherent right of self-defense recognized in Article 51 of the Charter of the United Nations.

5. The treaty or convention should embrace the entire program for putting the international system of control and inspection into effect and should provide a schedule for the completion of the transitional process over a period of time, step by step, in an orderly and agreed sequence leading to the full and effective establishment of international control of atomic energy. In order that the transition may be accomplished as rapidly as possible and with safety and equity to all, this Commission should supervise the transitional process, as prescribed in the treaty or convention, and should be empowered to determine when a particular stage or stages have been completed and subsequent ones are to commence.

Part IV—A First Report on the Scientific and Technical Aspects of the Problem of Control

INTRODUCTION

Nuclear physics was already a well-developed science when uranium fission was discovered in January 1939. Numerous nuclear transformations, some of them spontaneous, others induced artificially in the laboratory, were recognized as such and understood in considerable detail. It was known that nuclear energy was often set free in such transformations. Against this background, the discovery of fission was an interesting scientific event that added one more type of transformation which eventually found its natural place within the scientific picture.

But in the world of practical affairs, nuclear fission soon proved to be a discovery of the greatest consequence. Indeed, fission made possible a self-propagating release of enormous quantities of nuclear energy by means of a self-sustaining chain reaction. The first application was to mass destruction on a staggering scale. But, at the same time, the way was opened to a new era of industrial and scientific achievement.

On 31 July 1946, Committee 2 made the suggestion "that the Scientific and Technical Committee present a report on the question of whether effective control of atomic energy is possible, together with an indication of the methods by which the Scientific and Technical Committee considers that effective control can be

achieved." At the beginning of our discussion, it was realized that a broad exploration of the technically possible methods of controlling atomic energy to insure against its use as a weapon would inevitably lead us to the consideration of problems of a nontechnical or political nature, which would have to be taken into account in a system of control. Since political matters are wholly within the jurisdiction of other committees of the Atomic Energy Commission, it was decided to limit ourselves strictly to the scientific and technical aspects of the question.

International negotiations may lead in the future to definite political agreements, which would determine upon a system of control. In preparing this report, we have not made any suggestions as to the nature of such a possible future control system. The report is intended rather to draw attention to the scientific and technical facts which have to be considered in devising any system of control.

In approaching our task, we have constantly kept in mind that the problem before the United Nations Atomic Energy Commission is not solely the question of what to do about a frightful weapon, but rather the entire problem of what use shall be made of a discovery so great that its consequences will affect the future of human society.

Broadly speaking our report falls into the two following parts:

First, we present the basic scientific and technical facts governing the domain of atomic energy and show that the activities leading to peaceful and destructive ends in this domain are so intimately interrelated as to be almost inseparable (Chapters 1 and 2).

Secondly, we analyze the principal activities which will be carried on in the peaceful use of atomic energy, and point out the dangers which will exist if effective safeguards are not established against the use of atomic energy for destructive ends (Chapters 3 and 4).

Our Committee has of necessity dealt with limited information, all of which is nonsecret and has been previously published. Two categories of information have been available, that contained in the prewar scientific literature and that released after the bombing

of Hiroshima.[4] Much of the information in the latter category has not been given in full nor have all the scientific statements been confirmed by full description of experimental procedures, as is usual in scientific publication. It is equally true, however, that no scientific arguments would lead one to doubt the essential accuracy of this information. It represents an orderly extension of the prewar science of nuclear physics, and there are no apparent inconsistencies with this preexisting body of scientific fact.

There exists a possibility that the information with which the Committee has dealt may be incomplete in another sense, namely, that major discoveries, as distinguished from technological developments, may have been made somewhere in the world but not disclosed. Such discoveries, as well as any which may be made within the next few years, might well affect some aspects of the problem of control in a significant way. Logically such a possibility cannot be excluded; on the other hand there are scientific grounds for believing that discoveries unknown to us, which might seriously invalidate our analysis of the technical aspects of control, are improbable.

However that may be, this report is based on the information available to us, and we believe that the statements contained in it are relevant and significant for the problem of control, provided no major discoveries which would fundamentally affect the field of atomic energy are made or have been made.

Chapter 5 deals with the relation of the possibility of future discoveries and inventions to the problem of control. Chapter 6 summarizes our main conclusions.

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[4] The main body of information is contained in the well-known report by H. D. Smyth, entitled "Atomic Energy for Military Purposes," 1945. Additional information is contained in "A Report on the International Control of Atomic Energy" prepared for the United States' Secretary of State's Committee on Atomic Energy, 1946 (Lilienthal Board Report), and in the Press Release of the United States Department of State, 9 April 1946. Articles and announcements have also been published in the Physical Review and in other scientific journals. Useful summaries will be found in the two volumes of "Scientific Information Transmitted to the United Nations Atomic Energy Commission by the United States Member," dated 14 June 1946 and 10 July 1946.

Chain Reactions

Atomic energy in quantities useful for peace or war comes only from a nuclear chain reaction, which, like fire, is self-propagating and releases energy in proportion to the nuclear fuel consumed. Only one material found in nature in appreciable quantities has the property of "nuclear inflammability," though two other nuclear fuels can be created through the "burning" of the naturally occurring one.[5] The nuclear fuel provided by nature is uranium-235, one of the isotopes in naturally-occurring uranium, but present only in the proportion of one part in one hundred and forty. At this dilution the U-235 can be burned only under the very special circumstances achieved in a structure called a primary reactor (or "pile"). Otherwise, the U-235 must be partly or completely separated from the more abundant U-238. This process of isotope separation is exceedingly difficult and requires large and elaborate installations.

Two new materials (plutonium-239 or uranium-233) can be formed from U-238 or thorium in nuclear fires burning U-235. They can be isolated by chemical methods more easily than isotopes can be separated, and will serve as nuclear fuels as well as U-235.

Thus there are three materials (U-235, Pu-239, and U-233) from which nuclear energy can be obtained by a chain reaction. The reaction may be used to deliver energy at a steady rate by incorporating the fuel materials into a reactor, a lattice structure big enough to confine and utilize the neutrons which propagate the reaction from atom to atom. Controlled burning is achieved by inserting materials to absorb enough of the neutrons to prevent a run-away explosion, but not so many as to quench the reaction.

The same fuel materials may be burned explosively in an atomic

[5] The terms "nuclear inflammability," "burning" and "fuel" refer to nuclear reactions which resemble ordinary combustion only in the sense that "fuel" material is used up in a self-sustaining process which releases energy. The nuclear reactions are otherwise quite unlike ordinary combustion, and do not, for example, require oxygen.

bomb. Again, the amount of material must be large enough to trap and use the neutrons. The violence of the explosion depends also on the rate of burning, so materials that absorb the neutrons must be carefully excluded.

Whereas concentrated nuclear fuel is required for bombs, a less concentrated material is sufficient for peaceful applications. This has led to the suggestion[6] that material be added which may make the fuel less suitable for bomb production, while maintaining its suitability for use in a controlled reactor. Such materials, which are called "denaturants," must be chosen so that they are extremely difficult to remove from the fuel material proper.

Raw Materials

All the manifold applications of atomic energy depend on uranium and thorium as primary raw materials. It will be useful to trace the procurement of nuclear fuels from these raw materials. The pictorial chart (Appendix 1) and the flow chart (Appendix 2) indicate the principal stages and operations in processing uranium.

The mining and extraction of uranium ore and thorium ore is essentially a conventional operation comparable in scale with other mining operations, though not as large as many.

Uranium occurs principally in deposits of pitchblends found in Canada, the Belgian Congo and Czechoslovakia and also as carnotite and autunite in the western United States. Other deposits of uranium are found at numerous points throughout the world. The production at the start of the war was reported as not far from a thousand tons of uranium content per year.[7] Perhaps the principal difficulty which bears directly on the problem of control is that uranium is derived not only from uranium ores. In many cases, uranium is derived, or might be derived, as a by-product from the ores of other metals, mainly vanadium, and also by means of

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6 "A Report on the International Control of Atomic Energy" by the Lilienthal Board; Press Release of the United States Department of State, 9 April 1946; "Scientific Information Transmitted to United Nations Atomic Energy Commission by the United States Member," Vol. 1, p. 18.

7 Engineering and Mining Journal, Vol. 146, p. 80, September 1945.

retreatment of the new and old mine wastes, mill tailings, and the wastes and slags of the chemical and metallurgical plants, etc.

Thorium occurs principally in monazite sands in India, Brazil, the Dutch East Indies, Australia, and elsewhere.

It is to be expected that the search for new deposits of uranium and thorium, and the introduction of extraction methods for low grade deposits will greatly increase the potential supplies.

Processes for the Separation of U-235

There are two principal processes by which concentrated nuclear fuel can be produced from uranium: by the separation of the isotope U-235, and by the burning of the U-235 content of natural uranium to produce plutonium.

In the separation process, the first stage is chemical purification and the preparation of special uranium compounds, among them gaseous uranium hexafluoride.

Separation may be effected in several ways: In the gaseous diffusion method, the uranium compound in a gaseous state is forced through porous barriers. The U-235 isotope, being very slightly lighter, can get through the barrier somewhat more rapidly than U-238. By a large number of repetitions of the process it is possible to secure material which is considerably enriched in U-235. This is the process reportedly used in the very large plant at Oak Ridge, Tennessee. A related process depends on the difference in rate at which the two isotopes can move through a liquid layer between a heated wall and an adjacent cool one. This process is called thermal diffusion, and is also reported to have been used on a moderate scale at Oak Ridge. The third process, reportedly used on a large scale, is electro-magnetic separation. Intense beams consisting of molecules of a gaseous compound are projected into a magnetic field which bends their paths. The molecules containing the lighter uranium atoms, that is U-235, turn more sharply than the heavier molecules containing U-238, with the result that the isotopes are separated. There is an important difference which distinguishes this process from the others: the electro-magnetic method can yield substantially com-

plete separation of the isotopes as compared with a very gradual enrichment by the other processes, but does it only at the price of limited production. These methods require either many stages in the process of gradual enrichment (as in the diffusion methods) or many units operating in parallel to provide significant quantities (as in the electro-magnetic method).

The output of the isotope separation plant consists of uranium compounds enriched in U-235 content to a degree determined by their intended use. That is to say, the nuclear fuel is now less dilute, and after appropriate processing, is ready for use in industrial reactors or for the production of bombs.

Processes for the Production of Plutonium

Another process for the production of a pure nuclear fuel is to make plutonium from uranium. This involves a series of operations for the careful purification of the incoming uranium, the partial conversion of U-238 to plutonium in a primary reactor, the extraction and decontamination of the plutonium, and chemical and metallurgical processing to put it into usable form for reactors or bombs.

The chemical purification of the uranium compounds as they come from the refinery differs from usual industrial processes because of the extreme purity required. The many impurities which would absorb neutrons and thus quench the chain reaction of the reactor must be removed. The quantity of materials to be handled, and the rigid purification required (several impurities may not exceed one part in a million), combine to make the operation a difficult one. Other materials (known as "moderators") are required in the construction of the reactor, and these have also to be of extreme purity. An alternative to the production of very pure graphite or beryllium for this purpose is the production of heavy water, a difficult and large-scale operation in view of the quantities needed.

The primary reactor is a very large structure containing slugs of unenriched uranium metal interspersed through a moderator material such as graphite. In the reactor a chain reaction is set up,

which consumes some of the U-235 and produces excess neutrons. Some of these neutrons are absorbed by the U-238 and convert it to plutonium-239.

The uranium slugs, after use in the reactor, contain in addition to the unchanged uranium, plutonium and a variety of radioactive elements formed as by-products of the chain reaction. The separation of plutonium, while reasonably straightforward chemically, is a highly specialized operation because the low initial concentration of plutonium poses special problems, because the entire process must be handled by remote control to avoid danger from radiation, and because it is difficult to dispose of the radioactive by-products present with the plutonium and the uranium.

The plutonium compounds from the extraction plant are converted into metallic plutonium in a chemical and metallurgical plant. The plutonium metal from this plant is ready for use either in an industrial reactor or for the production of bombs.

Scale of the Installations for Producing Nuclear Fuels

Some of the complexities in the production of Pu-239 and uranium enriched in U-235 have been indicated in the discussion of the processes. An indication of the huge scale of the operations required for bomb production has been given in published descriptions of the plants which were constructed by the United States during the war. Some data on cost and physical dimensions taken from the United States publications has been tabulated in Appendix 3. One striking aspect is the small fraction of the total cost required for the facilities for bomb fabrication, as distinct from the production of the nuclear fuels for use in the bomb.

The Production of Uranium-233

Refined thorium compounds, after careful purification, yield thorium which can be incorporated into a primary reactor for the production of U-233. Chemical separation and the final production of U-233 in pure form require processes analogous to those for plutonium.

Naturally-occurring thorium is a single isotope and therefore no process of separation analogous to the separation of U-235 from

uranium is involved. Since this isotope has not the property of "nuclear inflammability," a primary reactor using thorium alone would have no fuel to maintain the chain reaction. It can only be used therefore if a fuel material is added. In general, the available information indicates that processes involving thorium have been less thoroughly explored than those utilizing uranium. Nevertheless, in this report U-233 is included as one of the nuclear fuels, even though the available information states only that it is theoretically possible to utilize U-233 in reactors and in bombs.

Summary

Atomic energy in amounts of importance for industrial activities is obtainable only from nuclear chain reactions which, like fire, are self-propagating.

Three materials are known which are useful as nuclear fuels for a self-sustaining chain reaction: only one of these (U-235) occurs in nature, constituting 0.7 per cent of ordinary uranium; the other two (Pu-239 and U-233) can be produced by nuclear reactions from uranium and thorium, respectively.

Nuclear fuels may be burned at a controlled rate in a reactor, or in a run-away explosion as in a bomb.

The raw materials for atomic energy, uranium and thorium, occur in widely scattered ore deposits. Mining and processing of the ores are more or less conventional operations. Prewar production was of the order of one thousand tons of uranium content per year.

The partial separation of U-235 from uranium to provide a high grade nuclear fuel has reportedly been accomplished by gaseous diffusion, thermal diffusion, and electro-magnetic methods. All of the processes require many separate stages or units, and huge installations, for significant production of concentrated fuel.

Plutonium (Pu-239) is formed by a nuclear reaction from uranium, specifically, from the abundant isotope, U-238. Highly purified uranium and very pure graphite can be fabricated into a primary reactor which will maintain a chain reaction burning the U-235 fraction of the uranium, and, at the same time, utilize this reaction to produce Pu-239 from the U-238 fraction.

The production of significant quantities of Pu-239 requires very large installations comprising highly specialized chemical extraction plants in addition to the primary reactors.

Cost data for the United States atomic bomb installations indicate a comparatively minor outlay for bomb fabrication as compared with the cost of production facilities for U-235 and Pu-239.

Thorium, as a source of nuclear fuel (U-233), differs from uranium in containing no "inflammable" fraction corresponding to the U-235 in uranium. Thorium can, therefore, be used in a reactor as a source of U-233 only if nuclear fuels are also added.

CHAPTER 2—UTILIZATION OF NUCLEAR FUELS

The practical applications of atomic energy all depend upon the energy, radiations, and radioactive materials resulting from nuclear chain reactions. Three fuel materials can be obtained in practical quantities: U-235, Pu-239 and U-233. The character and scale of the equipment in which these fuels are utilized differs for different applications and can best be considered in terms of the intended uses.

Power

The characteristic of a nuclear chain reaction which is perhaps most striking is the enormous quantity of energy released in the burning of comparatively small quantities of nuclear fuels. The consumption of a kilogram (about 2.2 pounds) per day of uranium-235 generates heat at the rate of approximately a million kilowatts. The same amount of heat could be obtained by burning about 3000 tons of coal per day, enough to supply the power and light for a city of about a million.[8] The use of atomic energy for the large-scale generation of electric power and for industrial heating are therefore challenging possibilities. Initially, at least, nuclear reactions will probably be used to generate heat which, by means of a heat exchanger, can provide steam for conventional turbo-

[8] At ten per cent efficiency, the heat obtained by burning a kilogram of U-235 per day could be converted into about 100,000 kilowatts of electric power.

generators producing electrical power. Many technical problems are involved in the use of atomic energy for power, but the development seems straightforward.

The large primary reactors which have been constructed for plutonium production generate a great deal of heat in the process, and might, by redesign, be used for power production. It seems probable that the size of reactors could be reduced by using concentrated fuel, although there are engineering limitations set by the rate at which heat can be removed from the structure, and the requirements for shielding personnel from the intense radiations. Published reports indicate that concrete walls more than five feet thick completely surround the large reactors at Hanford. Published estimates indicate that units for ships may be developed, but that smaller mobile units are unlikely on account of the bulk of the shielding required for the protection of personnel from the harmful effects of radiation.

It appears likely that reactors producing large quantities of power could be built which would not contain U-238 or thorium from which new nuclear fuel would be produced. Such reactors would be consumers only of nuclear fuel which would have to be produced elsewhere.

Reactors using so-called "denatured" fuel material will be considered in Chapter 3.

A possible complication in the operation of atomic power plants lies in the cumulative effects of the materials left over from the chain reaction. These comprise a variety of elements, usually called fission products, some of which may absorb neutrons to such an extent that they would reduce the efficiency of the reactor, or even stop its operation. Decontamination plants, analogous to the plants for extracting the plutonium produced in primary reactors, may therefore be needed.

Information is lacking on another important aspect of the operation of atomic power plants: This is the question of whether or not enough additional fuel can be made in a power reactor to replace the original supply of nuclear fuel being consumed. If not, the world supply of nuclear fuels is measured by the amount of U-235 present in nature, extended a fewfold by such additional

quantities of Pu-239 or U-233 as are generated in the consumption of U-235. On the other hand, if the regeneration of nuclear fuels, can fully replace the original materials, then all of the U-238, one hundred and forty times as plentiful as U-235, and also the world's supply of thorium which is more plentiful than uranium, constitute potential nuclear fuels.

Published information indicates that the generation of electric power from atomic energy is still in the early developmental stage, with active work in progress at Oak Ridge, Tennessee. Costs may be competitive with electric power from coal, at least in some parts of the world.

Radiations

In addition to the energy generated as heat in the operation of a reactor very intense radiations, particularly gamma rays and neutrons, are released. Such radiations from radium, large X-ray units, and cyclotrons, have been used in the past for radiation therapy. The intense radiations available from reactors should make them useful for these purposes. In industrial chemistry, new processes appear possible based on the chemical actions induced by intense and penetrating radiation. In physical research, the intense beams of radiation from reactors are already proving powerful tools.

Radioactive Isotopes

In addition to radiations, the operation of a reactor produces comparatively enormous quantities of radioactive materials, approximately a kilogram of fission products for each kilogram of nuclear fuel consumed. This material is equivalent in its effects to many thousand times the same amount of radium because of the more rapid rate at which many of its constituents disintegrate. Although the fission products consist of some thirty chemical elements of medium atomic weight, radioactive isotopes of most other elements can be produced as a result of neutron absorption. Since a great many neutrons exist inside and around an operating reactor, it is easy to use them in the preparation of substantial quantities of the desired isotopes. The availability of radioactive

materials in adequate quantities should permit a renewed and very vigorous attack by tracer techniques on many research problems, notably in physiology, medicine, and the mechanism of chemical reactions. Some of the fission products may possibly replace radium in cancer treatment in the future. There is in addition the possibility of new techniques based on the selective localization in malignant tissues of chemical compounds containing radioactive elements.

Comparatively small reactors will usually be adequate, and in many cases most convenient, for applications requiring radiations and radioactive isotopes, although the latter may often be obtained as by-products from large reactors operated for other purposes.

Atomic Bomb

The atomic bomb constitutes a highly specialized type of reactor in which the principal design requirement is that as much as possible of the nuclear fuel in the bomb shall be consumed in the very short time before the bomb bursts apart. Clearly, highly concentrated fuels are required to permit the most rapid combustion. Such materials will explode spontaneously as soon as the quantity of material in a single piece becomes large enough that the neutrons are effectively confined and utilized. The detonation of the bomb is then a matter of bringing together rapidly two or more pieces of fuel material which together exceed this critical size. Little more information than this has been released about the construction of atomic bombs, except that the critical size was predicted in 1941, within very wide limits, as more than two and less than one hundred kilograms.[9] In all probability, highly skilled personnel and specialized facilities are required for bomb production, but a large establishment does not appear to be necessary.

Estimates of the Amount of Power or the Number of Bombs Available

An estimate of the total electric power, or alternatively, of the number of bombs, which might result from the utilization of the

[9] Report of the National Academy of Sciences, quoted in Section 4.49 of "Atomic Energy for Military Purposes" by H. D. Smyth.

world's production of uranium can hardly be made with any reasonable accuracy. The present production of uranium, the amount of material required for a single bomb, and the fraction of U-238 (or thorium) which can be utilized for power are all figures which are not available. However, the annual production of uranium in 1939 can be estimated at approximately one thousand tons (uranium content in ores) on the basis of data in "Engineering and Mining Journal" for September 1945.

One might, as an example, assume that one thousand tons of uranium per year are available for the production of electric power. One thousand tons of natural uranium contain about seven thousand kilograms of U-235. This amount of U-235, used in power plants having an overall efficiency of ten per cent, could provide two million kilowatts of electric power for one year. If all of the uranium (and thorium) can be used, the amount of power available would be several hundred million kilowatts. In this connection, it may be of interest to quote a passage[10] from the report of the Lilienthal Board: "We have examined in some detail . . . the technical problems of making available heat and power on the scale of present world consumption from controlled nuclear reactors. We see no significant limitations on this development, either in the availability or in the cost of the fundamental active materials."

As an alternative example, if one were to assume that one thousand tons of natural uranium, containing approximately seven thousand kilograms of U-235, were available each year for the making of bombs, then using the limits on critical size given above as the amount of U-235 required for a bomb, the number of bombs which could be produced from all of the available uranium would be between seventy and thirty-five hundred per year.

Summary

There are three nuclear fuels (U-235, Pu-239 and U-233) which can be used in a sustained chain reaction yielding enormous quan-

10 "A Report on the International Control of Atomic Energy, "Section II, Chapter 3, 10th paragraph.

tities of heat, radiations, and radioactive materials. The consumption of one kilogram per day of U-235 releases energy at the rate of approximately a million kilowatts, and produces nearly a kilogram of radioactive materials per day.

The large-scale production of electric power from atomic energy appears feasible, though still in the developmental stage.

The engineering design of a large-scale power plant will determine whether it requires concentrated nuclear fuels such as are used for bombs or can use dilute or denatured fuel unsuitable for bomb manufacture; also, whether or not further production of nuclear fuel (Pu-239 or U-233) accompanies power production.

Small installations for power production appear unlikely for several reasons, one of which is the thick shields required to provide protection from radiation.

The intense radiations and the substantial quantities of radioactive material available from a reactor may be expected to find important applications in medicine, industrial chemistry, and nuclear research. The availability of radioactive isotopes opens the way for the intensive use of tracer techniques in chemical, physiological and medical research.

Comparatively small reactors will be adequate for most of these applications of radiations and radioactive isotopes.

The production of atomic bombs requires comparatively large quantities of concentrated nuclear fuels, and correspondingly large installations for the separation of U-235 or the production of Pu-239 or U-233. Bomb manufacture is a highly specialized, but hardly a large-scale, operation.

Examples based on published information suggest that raw materials are readily available for the production of from 70 to 3500 bombs per year, or for the generation of electric power at a rate of two million kilowatts, and possibly many times this rate.

CHAPTER 3—PEACEFUL USES OF ATOMIC ENERGY AND THEIR BEARING ON CONTROL

Introduction

In the foregoing chapters we have given a general description, based on published information which is limited but which we

believe is reliable, of the various activities involved in the production and use of nuclear fuels. It is to be expected that, in a peaceful state of the world, such activities will be carried on for beneficial purposes. Most of these same activities are also involved in the production of atomic weapons. Each of them involves an element of danger, since attempts may be made to divert materials or to seize materials or installations with the aim of using them for the production of atomic weapons. In the following discussion, the words "danger" and "dangerous" will always be used with this connotation. In this chapter we propose to analyze the relative importance of these dangers and to explore to some extent the problem of possible safeguards against them.

As regards diversion it may be observed generally that the later the stage at which diversion occurs, the more immediate is the danger arising from it because fewer subsequent operations, less time and fewer plants are then necessary to produce weapons. It should also be observed that attempts to divert materials at certain stages might be so planned as to take advantage of the fact that losses in processing are normal in metallurgical and chemical operations. The ease of diversion and the nature of necessary safeguards varies from stage to stage, and each will be considered in turn. It must be stressed, however, that all of the operations are interrelated, and the effectiveness of safeguards at any one stage depends in large measure on the safeguards erected at other stages.

In addition to diversion there is the possibility of seizure either of the fuel materials themselves or of the facilities for producing them. This will be dealt with in the final section of the chapter.

Uranium and thorium are, as far as can be foreseen, the only naturally occurring substances from which nuclear fuel in significant quantities can be produced. Hence, these substances play a fundamental and unique role in the control of atomic energy.

Mining Operations

Uranium and thorium are obtained from ores and deposits. It is clear that, unless appropriate safeguards are taken insuring that material cannot be diverted from the mining operations, attempts

may be made to use it for weapons. The consequences of diversion at this stage will not immediately be serious since it would require considerable time and industrial activity—how much precisely would depend on the facilities available—before weapons could be produced by clandestine operations.

In considering safeguards over mining operations, the following circumstances will be helpful. The mining operations, although widely different for the rich deposits and for the low-grade deposits, would always be on a significant scale; they take place along conventional lines and involve the handling of large quantities of ore, concentrates and tailings. It would hence appear feasible to keep track of the distribution of any significant quantities of material from the mines. A special significance must be attached to the devising of adequate safeguards against the diversion of raw materials, since none of the subsequent operations can proceed without uranium, or uranium and thorium.

Extraction from ore-concentrates and production of uranium and thorium compounds

Extraction and production of uranium and thorium compounds involve somewhat less bulk of material than has been considered in the previous section and may take place in plants far removed from the mines, as is the case in Canada. The processes involved are carried out in chemical plants of ordinary size and the products are still somewhat bulky. The processes normally involve losses comparable with those in other industrial chemical activities. These provide an opportunity to conceal diversion by making it appear that only process losses have occurred. Therefore, only the application of very close and careful safeguards would provide an adequate assurance against the diversion from these plants of purified chemical compounds of natural uranium or thorium for the surreptitious production of explosive material for atomic weapons.

Production of metal and preparation for insertion in reactors

Preparation of the metal from the uranium or thorium compounds also involves process losses which may be used to conceal diversion of material. The quantities of materials handled are less

and the difficulties in detecting diversion are greater than those in the chemical plants discussed in the previous section. There is also the possibility of diversion during the machining and the mechanical preparation of the metal for its insertion in atomic reactors. Just as in the previous case, very careful safeguards will be needed to prevent the danger resulting from such diversion.

Production of nuclear fuels

Production of nuclear fuels is the crucial stage in the operations. Both separation plants for the production of uranium enriched in U-235 and the reactors and extraction plants for the production of plutonium or U-233 deliver nuclear fuel, which, under proper conditions, may be used directly for the manufacture of atomic weapons. According to the published statements available to us, the installations necessary for weapon manufacture are relatively small and the time required is relatively short if the necessary high-skilled personnel is available and the procedure is known. If therefore the strictest safeguards are not taken to prevent the material in the installations producing nuclear fuel from being diverted, the danger is extremely serious.

The technical nature of the processes involved in the production of nuclear fuels is different for the different types of plants concerned. Very large installations are required, together with highly skilled personnel and methods differing widely from usual industrial methods. The final nuclear fuel product is very small in bulk compared with the quantities of material which are processed. It is possible that even those managing such plants will not find it easy to keep track in a quantitative way of the flow of materials, in much the same way as is the case in usual industrial refinery and extraction plants. These technical facts should be borne in mind when devising the safeguards against diversion mentioned above. It is clear that such safeguards should not only reckon with the materials in the installations themselves, but also with the stocks of purified product.

Remarks on operation of secondary reactors

Secondary reactors, i.e. reactors which are fed with nuclear fuel

especially prepared from the products of separation plants or of primary reactors, can be designed in various ways, depending on their purpose. Secondary reactors for research and medical purposes would be of low power and could be designed so as to contain insignificant quantities of nuclear fuel. These would be unimportant as possible sources of diversion, unless present in large numbers.

Secondary reactors for the production of electric power or industrial heating would be comparable in fuel consumption to primary reactors, i.e. the reactors which are fed with natural uranium. If they regenerated fuel, they would afford opportunities for diversion similar to those afforded by large primary reactors and in order to avoid this serious danger, the same strict safeguards would be required for both. If the secondary reactors were designed so as not to regenerate fuel, safeguards would still be required in relation to the fuel supply and to the circumstance that, by redesign and rebuilding, the reactor might be converted to other purposes.

It has been suggested[11] that secondary reactors for electric power or industrial heating, designed so as not to regenerate explosive material, might operate on "denatured" fuel.[12] If so, and to the extent that this proves to be technically feasible and effective, diverted material would not be usable for weapons without further processing, involving large plants and appreciable time.

Seizure of Installations

We have been discussing the possibilities of clandestine diversion of materials from the peaceful activities in the domain of atomic energy, but we must not overlook that with certain systems of control one would have to consider the possibility that plants or materials might be seized. This implies a danger, the seriousness of which would be greatest in the case of seizure of stocks of concentrated nuclear fuel, because from that stage weapons could

11 See Press Release of U.S. Department of State, 9 April 1946, and "A report on the International Control of Atomic Energy" by the Lilienthal Board, Section II, Chapter 5, Paragraph 10.

12 See Chapter I.

be produced most quickly and in relatively small plants. Next in order of seriousness would be the seizure of plants producing nuclear fuels. A wide geographical dispersal of stocks and plants and the restriction of stocks to minimum operating levels would reduce the risk that a large quantity would be involved in a single seizure. Seizures of mines or of facilities at other early stages would only be of advantage to those desiring to make weapons if they had at their disposal a plant capable of producing nuclear fuel.

CHAPTER 4—CLANDESTINE ACTIVITIES

Clandestine manufacture of atomic weapons from nuclear fuels diverted from stocks or from the plants producing such fuels would be extremely difficult to discover because the operations involved can be carried out in comparatively small installations which could easily be concealed. This emphasizes again the importance of preventing the diversion of nuclear fuels which we have stressed in the previous chapter.

If it were sought to divert materials from earlier stages of production, or from undisclosed mines, into the production of atomic weapons, large and complicated installations would have to be clandestinely operated in order to produce the nuclear fuels. The construction of such plants involves a large-scale industrial effort and many tributary activities of unusual character. On the other hand, it might be possible to break up such plants into a number of smaller units and thus make detection more difficult.

It would be difficult to carry on clandestine mining or concentrating of uranium or thorium ores if adequate knowledge of their geological occurrence were available. This is due to the large quantities of material which must be processed and the difficulty of concealing mining operations in general.

The maintenance and strengthening of the international community of scientists, the free exchange of scientific information and an increasing awareness among all scientists of one another's research activities would assist in making less likely the application of research talent to clandestine activities.

It is clear that the major assurance against clandestine activities

would lie in the existence of effective safeguards applied to known peaceful activities.

CHAPTER 5—FUTURE DEVELOPMENTS

Both layman and scientists are apt to believe that in the future scientific discoveries and technical inventions will be made which will bring further development of the activities in the domain of atomic energy. This raises a new question regarding control. For example, the possibility has been considered, in our discussions, that some day a method might be devised by which the separation of U-235 from natural uranium could be realized by methods less elaborate and costly than those actually used in the United States. It is clear that production of atomic weapons would thereby become easier.

There is also the possibility that some day raw materials other than uranium and thorium might be found suitable for the production of nuclear fuel. At the moment, such a possibility is highly speculative. Whatever the future may bring, those charged with responsibility for maintaining safeguards on atomic energy will best be able to make necessary adaptations in these safeguards if they are intimately associated with and participating in new developments in the entire field.

CHAPTER 6—SUMMARY AND CONCLUSIONS

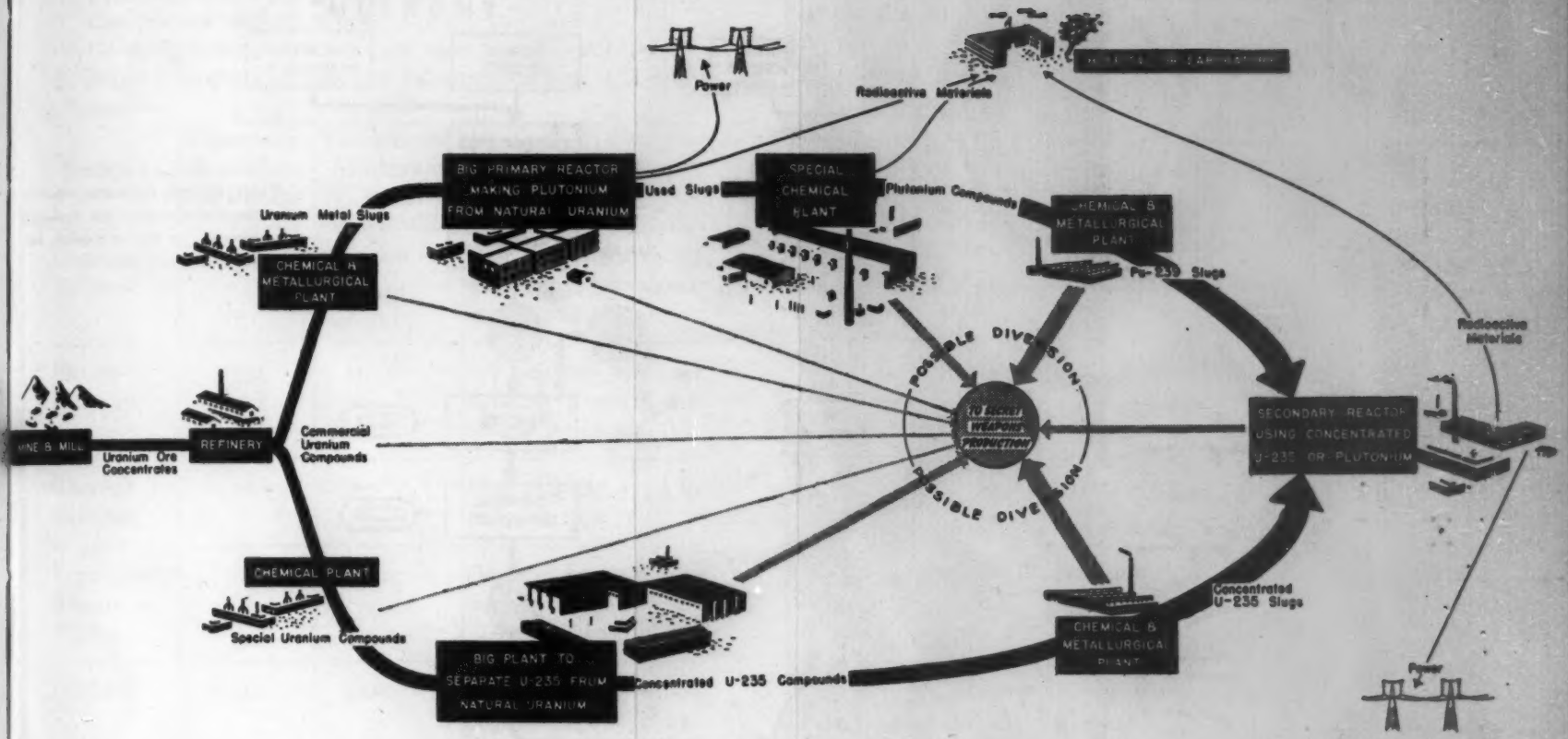
The substances uranium and thorium play a unique role in the domain of atomic energy, since as far as we know these are the only raw materials from which the nuclear fuel required for the development of atomic energy can be obtained. There is an intimate relation between the activities required for peaceful purposes and those leading to the production of atomic weapons; most of the stages which are needed for the former are also needed for the latter. The character of the different stages of the activities has been discussed in order to explore at each stage the elements of danger and to some extent the problem of safeguards against these dangers.

With respect to mining operations, which are of special sig-

nificance as the first step in these activities, it appears hopeful that safeguards are not too difficult. Particular attention should be paid to the installations in which concentrated nuclear fuel is produced since the product lends itself immediately to the production of bombs. Unless appropriate safeguards are taken at each of these stages, it will be difficult to insure that no diversion of material or installations will take place.

With regard to the question posed by Committee 2, "whether effective control of atomic energy is possible," we do not find any basis in the available scientific facts for supposing the effective control is not technologically feasible. Whether or not it is politically feasible, is not discussed or implied in this report, nor is there any recommendation of the particular system or systems by which effective control can be achieved.

PICTORIAL CHART OF THE PROCESSES USING URANIUM TO PRODUCE ATOMIC ENERGY



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Note– Waste products from the various stages in the processes may be reprocessed to recover the uranium or plutonium which they contain. For simplicity, such operations have not been shown.

ATOMIC ENERGY FLOW CHART

KEY

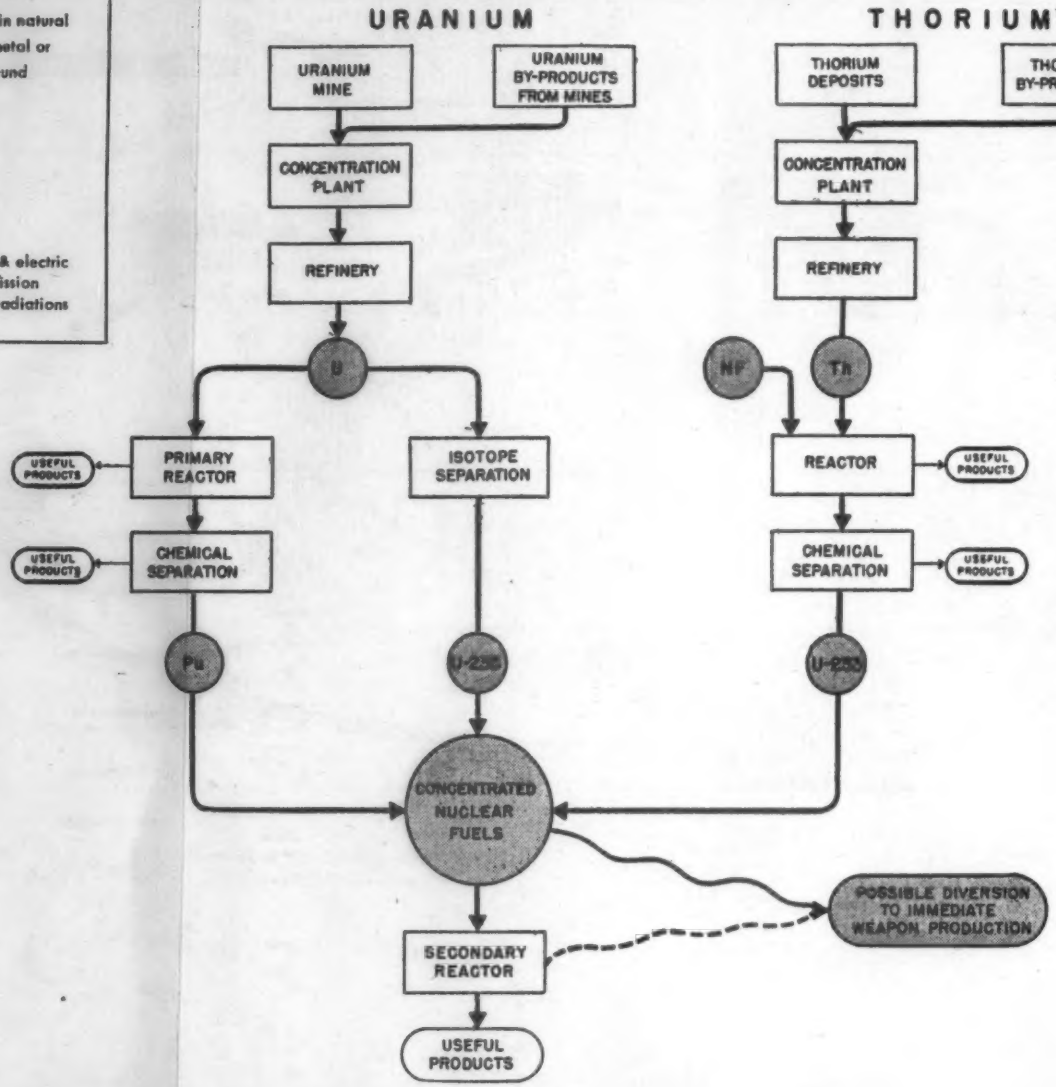
U — Uranium 238 & 235 in natural proportions as pure metal or pure chemical compound

NF — Nuclear fuel

Th — Purified Thorium

Pu — Plutonium

USEFUL PRODUCTS — e.g., energy for heat & electric power; radioactive fission products & isotopes; radiations



* Note: Available information indicates utilization of thorium less thoroughly explored than that of uranium, but theoretically possible.

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APPENDIX 3—SOME RELEVANT DATA ON COST AND SIZE OF U.S. ATOMIC BOMB PROJECT

A. General (including construction and other activities)
Funds appropriated to 30 June 1945 . . $1,950,000,000[13]
Construction workers at peak . . . . . 125,000[14]
Operating personnel on 6 August 1945 . 65,000[14]

B. Major Construction Costs and Indications of Size of Installations[15]

Installation	Expenditure in Millions of Dollars	Construction Workers at Peak	Size of Installations
Gasseous Diffusion	545	25,000	Four story building, ½ mile long, ¼ mile across, covering 60 acres
Electro-Magnetic	350	13,200	175 separate buildings including 9 major processing structures
Thermal Diffusion	10.5	——	Main building, 525 x 82 ft., 75 ft. high
Experimental Reactor at Clinton	12	3,247	Designed for 1000 kilowatt capacity
Hanford	350	45,000	600 square-mile site. 3 huge reactors and chemical separation plants. 780,000 cu. yds. of concrete
Los Alamos	60	——	——

13 Press Release by Secretary of War Stimson, 6 August 1945.
14 Press Release by President Truman, 6 August 1945.
15 Taken from the following publications:
"Hearings before the Special Committee on Atomic Energy," United States Senate, 29 November 1945. Government Printing Office.
Articles in *Engineering News-Record*, 13 December 1945.

Part V—First Report on Safeguards Required To Insure The Use of Atomic Energy Only for Peaceful Purposes

CHAPTER 1—GENERAL INTRODUCTION

The major task before the Atomic Energy Commission is to make specific proposals for the control of atomic energy in order to foster its use only for peaceful purposes and to prevent its use for destructive ends. This task has led us to an analysis of the types of safeguards necessary to afford protection against the hazards of violations and evasions. The report contains the first findings of Committee 2, limited to this aspect of the general problem. These findings have led to the conclusion that a single international control agency must be responsible for the system of safeguards and control. The Committee has not discussed the general characteristics of such an agency or its exact powers in the way, for example, of development, research, or the international planning of atomic energy production. Nor has it considered how the various safeguards would be administered in practice as part of an over-all system.

The report has been prepared in accordance with the following resolution adopted by Committee 2 on 8 October 1946:

> That Committee 2 proceed to examine and report on the safeguards required at each stage in the production and use of atomic energy for peaceful purposes to prevent the possibilities of misuse indicated in the Report of the Scientific and Technical Committee; that the Committee may hold informal meetings as it may decide, at which scientific Representatives may take part in the discussions.

The program of work adopted by Committee 2, on 21 October 1946, called for the consideration of three distinct kinds of possible misuse: diversion of materials, clandestine operations, and seizures of material or facilities. It was proposed that measures to prevent these possibilities of misuse be considered for each of the following stages in the production and use of atomic energy for peaceful purposes: uranium and thorium mines, concentration plants, refineries, chemical and metallurgical plants, primary reactors and associated chemical separation plants, isotope separation plants, and secondary reactors.

In the course of its deliberations, the Committee heard statements from a number of technical experts who furnished information on all the important stages from the raw material to the production of concentrated nuclear fuel and on other matters. The Committee desires to express its thanks to the Canadian, the United Kingdom, and the United States delegations which arranged for these experts to attend meetings of the Committee.

In the course of the Committee's work, definitions of certain types of safeguards have been formulated and have been used throughout this report. *Control* as used in this report is a general term which includes any or all types of safeguards. The types of safeguards which have been specifically defined are as follows:

1. *Accounting for materials* means the systematic measurement and reporting in prescribed form of quantities of key materials entering and leaving an establishment or installation, in process, and in storage. It includes prescription of the points at which measurements must be taken, the methods of measurements, and the manner in which the data are summarized into accounts. Accounting is normally accompanied by measures of analysis and auditing to insure conformity between the accounts and the facts. Analysis may be limited to an indirect check of the accounts to test them for consistency. In order to be thoroughly effective, however, accounting for materials must also be extended to direct and simultaneous auditing checks of the accuracy with which individual measurements are incorporated into summary accounts and the validity of the measurements themselves. This necessitates adequate independent observation of the measurements, tests of the accuracy of scales and other measuring instruments, and possibly independent duplicate measurements either on a sampling basis or as a whole. It also implies the right to obtain explanations of discrepancies. When auditing is extended to independent direct checks, it becomes one element in inspection.

2. *Inspection* means close and careful independent scrutiny of operations to detect possible evasions or violations of prescribed methods of operation. In addition to direct auditing measures as described above, inspection may include observation of points of ingress to and egress from an establishment or installation to insure that materials and supplies are flowing in the prescribed manner, observation of the activities within the establishment or installa-

tion, and measures in the form of aerial or ground survey and otherwise to guard against clandestine activities. To be fully effective, the power of inspection may require that the operations be carried on in a specified manner in order to facilitate the inspection. In this event, inspection verges on supervision.

3. *Supervision* means continuous association and cooperation in day-to-day operations with the management, together with authority to require that the management comply with certain conditions so as to facilitate the execution of measures of control. For example, it may include the right to require that plants be designed and constructed in such a manner as to hinder diversion of materials, the right to require that the processes be conducted in a specified manner, or the right to order cessation of operations to take a complete inventory of materials in process. The more extensive the intervention of the supervisors into such matters, the closer supervision approaches management itself.

4. *Management* means direct power and authority over day-by-day decisions governing the operations themselves as well as advisory responsibility for planning. Managerial control means internal control of a plant by a director or manager. Management by the international control agency means that the management is established by and is responsible to such an agency. Management is normally a prerogative of ownership but need not imply ownership.

5. *Licensing* is a type of safeguard in which the degree of control is determined by the licensing agreement. It means the granting of permission to conduct certain activities under specified conditions. The conditions may include accounting and reporting requirements, rights of inspection or supervision, conformity with approved plant design or processes, etc. Similar results may be obtained through the leasing of establishments or installations from the international control agency or through a management contract, where the conditions are specified in the lease or contract, but leasing is not a prerequisite of licensing.

As explained above, Committee 2 has stressed the specific types of safeguards which should be applied at the several stages in the production and utilization of atomic energy. By this method, the Committee has sought to reach conclusions concerning individual elements of control. While this method is a logical one and enables a study to be made of the separate parts of the problem,

the findings thereby arrived at must be viewed in the light of the general objective of securing an effective and enforceable system of control. The detailed findings contained in Chapters 2 to 8, inclusive, are interrelated. The coordination of safeguards is discussed to some extent in Chapter 8, but further measures of coordination must be considered before formulating a comprehensive system of control.

The specific control measures mentioned in the findings are not meant to be definitive but rather to be indicative of the various types of safeguards applicable at each stage. In devising a definite system of control, provision must be made for flexibility in adapting safeguards to a rapidly developing technology. The findings are, moreover, of a technical nature. It has been assumed in the preparation of the report that the staff of the international control agency would be technically competent and loyal to the agency and that it would exercise its functions thoroughly but without encroaching on matters beyond the requirements of the implementation of its mission. It has been assumed, furthermore, that the agency would treat with the necessary discretion information which it acquires.

In considering the types of safeguards to be applied at particular points, the objective has been to provide effectiveness of control with the least interference in normal activities. An ineffective system of control would be worse than none. The interference in a country's normal activities introduced by an effective system of control would be small compared with the disturbances which would result from the defense measures necessary for protection against atomic weapons.

In the preparation of this report there has been no discussion of the type or character of the international control agency in which control authority is to be vested. The over-all powers required by an authority depend upon the functions entrusted to it. Only the functions of providing safeguards against diversion from declared establishments and of discovering clandestine operations have been considered. The question of seizure of atomic energy establishments or materials by a nation intending aggression has only been recognized as a problem for future consideration. The

findings, therefore, do not represent a plan for atomic energy control but only some of the elements which should be incorporated in any complete and effective plan.

(A Summary of Findings on Safeguards is included in PART II).

CHAPTER 2—SAFEGUARDS NECESSARY TO DETECT AND PREVENT THE DIVERSION OF URANIUM AND THORIUM FROM DECLARED MINES AND MILLS

Introduction

In the general problems of safeguards, the mines and ore deposits occupy a special position. A complete control at this stage would give a starting point from which it might be possible to keep track of potentially dangerous material through all its later stages. In this connection, the report of the Scientific and Technical Committee states: "A special significance must be attached to the devising of adequate safeguards against the diversion of raw materials, since none of the subsequent operations can proceed without uranium, or uranium and thorium."

Findings for Mining and Milling of Uranium

1. *In considering the diversion of uranium at the mining and milling stage, one need only be concerned with substantial quantities of material. Occasional petty theft by miners or mill operatives would not be a matter of consequence.*

The diversion of many tons of ore would be required to make a few pounds of the finished nuclear fuel.

2. *Safeguards to prevent diversion should be determined, to some extent, by the richness of the ore mined. They should be stringent at rich mines and might be less strict for low-grade deposits.*

The uranium content of ores varies considerably, ranging from very rich uranium ore to deposits containing small fractions of one per cent of uranium. When considering the latter, the following points should be kept in mind:

Ores with a low uranium content are sometimes found in deposits which can be worked by open-pit methods. This means that operations may be scattered over a wide area, and such controls as could be set up at points of egress (e.g. from a mine shaft) would not be possible, unless the whole area were under

guard and, if feasible, enclosed. It is probable that in the future substantial amounts of uranium will be drived from very low-grade ores containing other valuable elements. Clearly more rigorous safeguards would become necessary as the uranium becomes concentrated. One must also not overlook dumps of tailings from various mines, mills, and even from certain chemical plants, because these, too poor to have been worked so far for uranium, might contain a very appreciable total amount of this metal.

Knowledge of ore reserves in certain known mines would be a further safeguard against diversion. However, in most mines, sampling methods to prove ore reserves would be inaccurate and difficult to apply as a control measure.

3. *The system of accounting, guarding, and inspection of uranium mines and mills could follow the normal patterns ordinarily used in the control of mining and milling operations.*

Assuming that egress from the mines or mills is under control by guards checking the contents and destination of shipments, it would appear that substantial or systematic theft of ores or concentrates would probably be detected.

In addition to the physical guarding of its property, management normally has a system of control in its plants to insure efficient operation. The controls used by the management are designed primarily with a view to detecting technical inefficiencies and insuring and maintaining maximum recovery. They give a very close check on the flow of material over a long period of time, though they may be inaccurate over short periods.

Adequate facilities for weighing, assay, and analysis are required by the inspectorate. In the simplest case of inspection, the operating controls used by the mine and mill management could be examined and verified with comparative ease by the inspectorate. Under other circumstances, it might be necessary to duplicate controls by having a completely independent and reliable assaying and sampling laboratory. One such laboratory could service a number of mines and mills.

4. *An adequate system of inspection could be so organized as not to interfere seriously with normal mining and milling operations.*

Inspection of mines and mills is not a new problem but one that has been solved satisfactorily by government authorities inspect-

ing managements to prevent the diversion of the raw materials under government control. It has been proved possible for an independent inspectorate to review the accounting procedures used by the management, check the weighing and assaying equipment, make independent observations, etc., without seriously hampering the management. Experience of this kind has been particularly in the field of precious minerals where very small diversions are important; inspection to detect large-scale diversions should be even less of an interference.

5. *The inspectorate must have unrestricted access to all equipment and all phases of the operations and have facilities for independent weighing, assay, and analysis.*

It is clear that its complete independence of the local management must be unquestionable.

6. *The number of guards and inspectors required for uranium mines and mills would not be great as compared with the operating staff.*

The duties of the inspectors would require varying degrees of technical skill and could not be regarded as purely police functions. Persons could be regarded as qualified to serve as the head of a mine or mill inspectorate if, in addition to professional training and experience as engineers, they were given a short course of special instruction.

7. *The comparison of weights and assays of the shipped material at the exit from the mill and on arrival at destination would provide a necessary check on possible diversion in transit.*

Such checks are normally carried out in mining and refining and would be all the more important in the case of uranium concentrates.

Summary

Adequate safeguards against diversion from declared mines and mills are possible by a system of inspection, including guards, similar to normal managerial operating controls, provided that the inspectorate has unrestricted access to all equipment and operations and has facilities for independent weighing, assay, and analysis.

Findings for Mining and Milling of Thorium

1. *The danger inherent in the diversion of thorium is less immediate than in the case of uranium.*

Thorium cannot be used by itself for the production of atomic energy; it requires reactors which also use natural uranium or nuclear fuel.

2. *The control of thorium would be in some respects more difficult than in the case of uranium.*

The most common occurrence of thorium is in monazite sands; and the great extent of some deposits, which may be scattered over hundreds of miles, together with the relatively simple equipment required, makes illicit removals relatively easy. In view of the generally low content of thorium in the sands, however, only a large quantity of material would be significant, and frequent or large-scale illicit operations would probably be readily discovered.

3. *Controls for thorium could still be of the same type as those for uranium.*

The problems involved in the control of diversion from declared thorium deposits are fundamentally the same as those met in the control of uranium. A system of inspection applied to operations for extracting monazite from sands could follow the same general pattern of material accounting by technical methods together with guards to check shipments and prevent unauthorized removal.

The guarding and patrolling at monazite sand deposits would be relatively more important than in the case of most uranium occurrences.

Summary

Effective control of the raw material and concentrates of thorium is possible through a system of inspection similar to that found adequate for uranium.

CHAPTER 3—SAFEGUARDS NECESSARY TO DETECT AND PREVENT THE DIVERSION OF URANIUM AND THORIUM FROM DECLARED REFINERIES AND CHEMICAL AND METALLURGICAL PLANTS

Introduction

In connection with the problem of safeguards at refineries and chemical and metallurgical plants, the report of the Scientific and Technical Committee states: "Only the application of very close and careful safeguards would provide an adequate assurance against

the diversion from those plants of purified chemical compounds of natural uranium or thorium for the surreptitious production of explosive material for atomic weapons."

Findings

1. *Total diversion to be dangerous would still be measured in terms of tons, but, because of the greater purity of the materials involved, the quantities concerned would be smaller than in the mining and milling stages.*

2. *An adequate system of inspection of uranium refineries and chemical and metallurgical plants could follow the normal patterns ordinarily used in the control of similar industrial operations.*

As in the case of mines, a system of guards should be provided to control egress from the plant and to check the content and destination of shipments.

Methods of assay and measurement as a basis of accounting have been so developed that at some refineries and chemical and metallurgical plants the uncertainty (technically, the "probable error") on the balance sheet assessed over a period of about a year can be kept by good management to about one percent of the material entering the plant. It is possible in such plants to make a material balance with this accuracy at any time by a clean-up of the material undergoing processing. This naturally interrupts operations, but could reasonably be required at regular intervals and in addition whenever the suspicion of diversion arises. Without a clean-up the uncertainty in the balance over periods of about a month may be several times as great and may vary widely.

Facilities for independent assay and analysis would be part of any inspection system. These might take the form of a central laboratory serving a large number of different plants.

3. *An adequate system of inspection could be so organized as not to interfere seriously with normal refining and chemical and metallurgical operations.*

As in the case of mines, this kind of inspection is not a new problem but one that has been met and solved in commercial practice.

It is a matter of common practice for the management to shut the plant down at intervals and clean the material out of the various stages of the process. This enables a more accurate accounting to be made of the flow of material through the plant.

An additional safeguard, applicable only to refineries treating the ore concentrates, is a cross-check by comparison of the uranium balance with the balance of radium.

4. *The inspectorate must have unrestricted access to all equipment and all phases of the operations and have facilities for independent weighing, assay and analysis. It must also have the right to require the plant to be shut down for purposes of clean-up and accounting at appropriate times, and also to require efficient operating procedure, assuming to this extent a supervisory character.*

5. *The number of guards and inspectors required would not be great as compared with the operating staff.*

The duties of the inspectors would require varying degrees of technical skill and could not be regarded as purely police functions.

A person could be regarded as qualified to serve as the head of the inspectorate of a refinery, chemical or metallurgical plant if, in addition to having a suitable professional degree and experience, he were given a few months of special instruction.

6. *The comparison of weights and analysis of the shipped material when leaving refineries or chemical and metallurgical plants and on arrival at destination would provide a necessary check on possible diversion in transit.*

Such checks are normally carried out in dealing with chemicals and would be all the more important in the case of pure uranium metal or compounds.

Summary

Adequate safeguards against diversion from declared refineries and chemical and metallurgical plants are possible by a system of inspection, including guards, similar to normal managerial operating controls, provided that the inspectorate has unrestricted access to all equipment and operations and has facilities for independent weighing, assay, and analysis and provided that it has the right to require the plant to be shut down for purposes of clean-up and

accounting at appropriate times and to require efficient operating procedure.

At these stages, there is no fundamental difference between the processes for thorium and for uranium.

CHAPTER 4—SAFEGUARDS NECESSARY TO DETECT AND PREVENT THE DIVERSION OF URANIUM FROM DECLARED ISOTOPE SEPARATION PLANTS

Introduction

The separation of U-235 from natural uranium and the enrichment of the U-235 content of natural uranium may play an important part in the peaceful use of atomic energy.

Although it is possible that many different processes may be devised for the separation of the isotope U-235 from naturally occurring uranium, existing plants fall into two main groups:

(a) Electromagnetic separation plants.

(b) Plants based on diffusion processes.

Isotope separation plants may increase the concentration of U-235 in uranium in varying degrees including that necessary for direct use in an atomic weapon. The necessity for adequate safeguards against diversion presents itself therefore, in these plants, in an acute form.

In this connection, the report of the Scientific and Technical Committee states: "Production of nuclear fuels in the crucial stage in the operations. . . . Separation plants for the production of uranium enriched in U-235 . . . deliver nuclear fuel which, under proper conditions, may be used directly for the manufacture of atomic weapons. . . . If, therefore, the strictest safeguards are not taken to prevent the material in the installations producing nuclear fuel from being diverted, the danger is extremely serious."

Findings

1. *Present electromagnetic and diffusion separation plants have in common the following features which are of importance in determining the necessary safeguards:*

(a) *The complexity and large extent of plants capable of separating significant quantities of U-235.*

(b) *The large amount of material at any time in various stages of concentration in the plants.*

(c) *The difficulty, under the presently available methods of measurement and with present processes, of any strict accounting of U-235 between the input and output materials.*

(d) *The large staff required to operate the plants.*

(e) *The absence from the plants of the radiation hazards which provide natural safeguards in certain phases of the operation of reactors.*

2. *The nature of the plants and the kind of processes to which the material is subjected do not preclude the application of adequate safeguards.*

3. *The necessary close supervision of the processes and the necessary security measures could only be provided by managerial operation by the international control agency of the whole plant.*

Summary

At present, it is not possible to place reliance on the method of obtaining a material balance of uranium isotopes in the case of isotope separation plants. This is one of the important reasons why there must be internal control of such plants by a director or manager and why the management must be established by and responsible to the international control agency. Even if the material balance could be greatly improved, the inherent danger of the operation would still require management by the international control agency.

CHAPTER 5—SAFEGUARDS NECESSARY TO DETECT AND PREVENT THE DIVERSION OF URANIUM, THORIUM, AND PLUTONIUM FROM DECLARED NUCLEAR REACTORS AND ASSOCIATED CHEMICAL EXTRACTION PLANTS

Introduction

Reactors may vary greatly in size and design. Present reactors include the large units at Hanford, designed for the production of plutonium from natural uranium, and small reactors for research purposes. Other reactors may be designed primarily for the production of power but may produce nuclear fuel as well.

The chemical plants associated with reactors are for the extraction of the fissionable and radioactive materials produced in

the reactors and therefore they introduce the problem of safeguards against the diversion of materials which, even in relatively small quantities, could be used for the immediate manufacture of atomic weapons.

In this connection, the report of the Scientific and Technical Committee states: "Production of nuclear fuels is the crucial stage in the operations. . . . The reactors and extraction plants for the production of plutonium or U-233 deliver nuclear fuel which, under proper conditions, may be used directly for the manufacture of atomic weapons. . . . If, therefore, the strictest safeguards are not taken to prevent the material in the installations producing nuclear fuel from being diverted, the danger is extremely serious."

Available information indicates that the utilization of U-233 as nuclear fuel, which can be made from thorium by neutron absorption, though less thoroughly explored than that of plutonium, is theoretically possible. It is believed that safeguards similar to those for uranium and plutonium would be required for thorium and U-233.

Some types of secondary reactors use feed material which is so enriched that it must be very closely safeguarded. Except in this respect, primary and secondary reactors which produce nuclear fuel present similar control problems.

Findings

1. *The preparation of natural uranium in an appropriate form for insertion in reactors requires safeguards similar essentially to those for the preceding chemical and metallurgical plants.*

2. *The international control agency must insure that no uranium or thorium is surreptitiously placed in or around the reactor.*

Uranium or thorium surreptitiously placed in or around the reactor would absorb excess neutrons and thus generate fissionable materials which might escape detection.

3. *The injurious radiations from fission products provide a natural assistance to safeguarding against diversion of slugs from the time they are exposed to the neutrons in a working reactor until the radio-active fission products are removed in the chemical extraction plant.*

Unless they were transported in containers of conspicuous

weight and bulk, slugs which have been in the reactor for any length of time would emit radiations which would be both easy to detect and likely to be fatal to those attempting diversion.

4. *The international control agency should supervise the design of the reactors and their associated chemical extraction plants to the extent necessary to preclude features that would make safeguards against diversion difficult. It should also see that construction proceeds according to design.*

It is possible otherwise that devices might be put in place during the construction of the reactor or plant through which slugs might be withdrawn with comparative safety.

5. *The international control agency should continuously obtain all relevant information on the operation of the reactor by observation and measurement.*

This information should include data on the reactor's characteristics and performance, in order that estimates can be made of the amount of plutonium produced and in order that misuse of the reactor can be detected.

6. *The diversion of nuclear fuel during the purification process would be extremely grave and might be very difficult to detect.*

Diversion becomes easier as concentration is completed and purification proceeds because both the bulk and radioactivity of the material are decreased, making detection more difficult and diminishing the hazard to those engaged in illicit work.

7. *As now in operation, the extraction procedure is such that the diversion of purified nuclear fuel might be camouflaged as normal operating losses.*

The amount of nuclear fuel in the slugs cannot be accurately determined to begin with, and the losses during chemical treatment introduce further uncertainties. The task of control would be facilitated if in the future methods for establishing an accurate balance sheet could be developed.

8. *Diversion of purified nuclear fuel is difficult to detect. Assurance against such diversion, therefore, requires that the international control agency itself carry out the functions of management in the case of chemical extraction plants.*

9. *The international control agency must establish the strictest possible*

safeguards against diversion of highly enriched or pure nuclear fuel during processing, storage, and shipment.

The nuclear fuel in these conditions is in its ultimate form and can be put to use in an atomic weapon within a few days.

10. *From the nature of things, it is not possible at the present moment to decide in a general way the type of control which will offer adequate safeguards against diversion from reactors, but, in many cases, management by the international control agency may be the only adequate safeguard. Secondary power reactors may be fully as dangerous as primary reactors of equivalent capacity, since either may be used to produce nuclear fuel.*

11. *Satisfactory safeguards in the case of small reactors for research purposes and their associated chemical plants could be provided by a system of licensing and periodic inspection by the international control agency.*

Small reactors for research purposes are those not capable of producing nuclear fuel at a rate significant for military purposes. More stringent safeguards might be required where a number of such reactors with a large total content of nuclear fuel or a large potential production exist in any country, or territories under the same national jurisdiction, since a number of these reactors in combination may be fully as dangerous as a large reactor.

Summary

A. At present, it is not possible to place reliance on the method of obtaining a material balance of plutonium in the case of reactors and associated chemical extraction plants. This is one of the important reasons why the chemical extraction plants and, in some cases, the reactors should be subject to internal control by a director or manager and why the management must be established by and be responsible to the international control agency. Even if the material balance could be greatly improved, the inherent danger of the operations would still require management by the international control agency.

B. The safeguards required for the control of reactors will depend on their size and design and especially on their content and possible rate of production of nuclear fuel. The safeguards available to the international control agency should include licensing

and inspection, supervision, and management of the operation of reactors. In addition, close supervision of the design and construction of reactors is essential in all cases.

C. Periodic inspection together with licensing is an adequate safeguard in the case of small research reactors and their associated chemical plants, unless their total content of nuclear fuel or potential rate of output in any area is of military significance.

D. Adequate safeguards for chemical extraction plants associated with all except small research reactors are only possible through management by the international control agency.

E. Adequate safeguards during the preparation of high-grade or pure nuclear fuels in a suitable form for insertion in secondary reactors, and, during the storage and shipment of such fuels, are only possible through management by the international control agency.

CHAPTER 6—SAFEGUARDS NECESSARY TO INSURE THE DETECTION OF CLANDESTINE ACTIVITIES

Introduction

Like all problems in atomic energy, the detection of clandestine operations is greatly simplified by the technical facts of the field. Nevertheless, general and political considerations play a larger part in the effectiveness and acceptability of any system for the detection of clandestine operations than in most other parts of the problem. Thus, any form of general inspection by an international control agency raises problems which are beyond the scope of this present inquiry. They will need most careful consideration when the functions, powers, and organization of the agency are defined. It will be here that the conflicts between the requirements of the international control agency on the one hand and considerations of national sovereignty and present practice on the other will have to be resolved. Throughout this chapter of the report, we shall not always state, but shall always assume, that adequate restraints have been provided against the abuse by the international control agency of the wide powers which it must necessarily be given and that it will conduct its activities in conformity with the established regulations.

Measures for the detection of clandestine operations in the

realm of atomic energy must be based on information from a variety of sources coordinated and evaluated by a central agency. The control of declared activities will itself provide much useful information. This information, combined with geological data, aerial and ground surveys, (see note of Professor Alexandrov in Finding 5), and periodic reports on specified subjects, will aid in directing attention to areas and operations which might be involved in clandestine activities.

It is essential that, within properly defined limits, the international control agency be granted freedom of travel, the right of access for inspection, and the right to conduct aerial or ground surveys, if there is to be assurance that clandestine activities on a significant scale will be found. Reasonable and proper use of these rights is necessary to avoid undue interference with activities unrelated to atomic energy, and appropriate restraints are necessary. Even so, it seems inevitable that any system of inspection adequate to insure the detection of clandestine activities will result in knowledge and inspection of activities unrelated to atomic energy. Particular restraints should therefore be provided against the misuse or disclosure of information secured by the international control agency in the course of its activities.

It appears impracticable and undesirable to attempt the routine inspection of the total industrial operations of a nation in order to detect possible clandestine activities in the realm of atomic energy. Consequently, the problem of detecting clandestine operations at stages subsequent to mining and milling involves, first, the establishment of reasonable grounds for suspecting clandestine operations in a particular plant or area, and, second, the direct inspection of buildings and installations to the extent necessary to resolve reasonable doubts. Stringent safeguards against clandestine mining and milling operations, together with strict control against diversion from authorized activities at all stages, will reduce the necessity for extensive inspection of ordinary manufacturing and processing installations, in which interference would be most irksome.

Findings

1. *The right of authorized personnel of the international control agency*

to direct access and inspection, subject to appropriate restraints, and the right to travel without restraint, is essential in the detection of clandestine activities.

Direct inspection is the most reliable means of detecting clandestine activities; hence, the right of inspection wherever suspicion exists constitutes an important safeguard. It would in general be necessary to require that demonstrable grounds for suspicion exist as a justification for inspection and to establish reasonable legal procedures for the regulation of inspection. The procedures must not delay legitimate access by the international control agency. However, there are activities and installations which are so closely linked to atomic energy activities or so readily converted to such activities that their existence per se is cause for suspicion and justification for inspection. This includes all mining operations in areas known or likely to contain uranium or thorium in significant amounts. It includes chemical or metallurgical plants processing concentrates which contain even small proportions of uranium or thorium. It includes also certain types of industrial installations, and these should be specified.

2. *The character and scale of operations using known processes for the production of significant quantities of nuclear fuels provide useful indications of their existence.*

Some of the signposts which point to the existence of these operations are:

(a) Mining operations must be substantial.

(b) Large or characteristic installations are required in the case of isotope separation plants, primary reactors, and chemical extraction plants.

(c) Large amounts of power are required for isotope separation plants.

(d) Large quantities of fresh water are required, principally as a cooling medium, in the case of certain reactors. Consequently, such plants are likely to be located on rivers or lakes.

(e) In the case of reactors and associate chemical extraction plants, radioactive wastes are produced.

(f) Extensive shielding against radiation is required in the case of reactors and associated chemical extraction plants.

The above signposts apply to present types of plants. Rapid

technical developments and changes in processes are to be expected, but there is no technological basis for expecting that developments of the next several years will permit the use of installations which are not large enough relative to other industrial installations to attract attention. The importance of this consideration lies in the fact that the size of the installations is the best guarantee that their existence in suspected areas could be detected by aerial surveys. It might be possible to subdivide certain operations in an effort to escape detection, but this would entail an increased number of installations.

3. *The international control agency would need periodic reports from States on categories of information directly related to the production and use of atomic energy. Certain ancillary information would also be desirable.*

Categories of information on which States should submit reports include:

(a) Geological formations in which uranium and thorium might occur.

(b) Mining operations large enough to be potential sources of uranium or thorium.

(c) Production shipments, location, and use of specialized equipment and supplies such as:

Mass spectrometers,
Diffusion barriers,
Gas centrifuges,
Electromagnetic isotope separation units,
Very pure graphite in large amounts,
Heavy water, and
Beryllium or beryllium compounds in large amounts.

Categories of information which would be desirable include:

(a) Large engineering construction.

(b) Large producers or consumers of heat or electricity.

4. *The international control agency should coordinate the available information and thereby determine what areas and installations require further inspection to resolve reasonable doubt that they contain clandestine activities.*

Information of value in the detection of clandestine activities

will become available to the international control agency in the course of its control of declared activities.

Information about activities in specific areas could be secured by an appropriate combination of aerial and ground surveys (discussed in Finding 5).

General information related to the production and use of atomic energy could be provided by a system of periodic reports from all national governments (discussed in Finding 3).

Although no one of these types of information alone provides complete assurance that clandestine activities would be detected, the correlation of such information provides a guide to areas and activities requiring direct inspection for clandestine operations.

5. *Aerial surveys combined with ground surveys and direct inspection are essential in some circumstances for the detection of clandestine operations.*

Aerial surveys are essential in some circumstances to the detection of clandestine operations in areas difficult of access or sparsely populated. The international control agency must therefore be granted the right, under appropriate limitations, to conduct such surveys. In some cases, it will be necessary for the agency to have the permanent right to conduct periodic aerial surveys over areas where uranium and thorium ores are known, or likely, to be found. Air surveys should also be authorized in other cases where grounds for suspicion of clandestine operations are shown in accordance with the procedural requirements referred to in Finding 1.

As a source of information, aerial photograph provides a record that is factual, objective, definite, and permanent. Moreover, aerial surveys reduce the time and cost of securing information, especially in examining large areas for unreported mining activities.

(NOTE: During the course of the discussion of the proposals concerning the detection of clandestine activity by means of aerial photography and ground surveys, Professor Alexandrov (U.S.S.R.) stated that the proposals under discussion did, to a great extent, touch more on economic and other spheres not related to atomic energy than on the question of the detection of clandestine activity in the mining and refining of uranium and thorium ores. On this basis, Professor Alexandrov declined to participate in the discussion of those sections of the document dealing with this type of detection.)

Aerial surveys constitute one source of information about geological formations. The completeness of this information varies with the character of the terrain but must ordinarily be supplemented by ground surveys. Aerial surveys have been used successfully to locate areas in which the occurrence of uranium ores appeared probable, and was later confirmed by ground exploration.

Periodic aerial surveys of areas known, or likely, to contain uranium or thorium ores can readily discover the existence of mining operations. Ground inspection would be required to determine the products of the mines.

Aerial surveys are particularly useful for determining the existence or nonexistence of industrial installations in an area in which clandestine activities are suspected. The interpretation of aerial photographs of highly industrialized areas is more difficult than in the case of nonindustrial areas, but may be a fairly reliable guide in either case. Aerial photographs give considerable information about the general character of the operations conducted in an installation: power requirements; water requirements; and the flow of raw materials and products. However, direct ground inspection is necessary to determine accurately the character of the operations.

New installations, or extensive modifications in existing installations, are readily detectable by comparison of aerial photographs taken at successive intervals.

Camouflage is not very effective against photographic aerial survey but makes it difficult to determine the nature of the installations under observation.

6. *Ground surveys are a useful means for the detection of clandestine operations; under certain conditions, the right to conduct such surveys is essential.*

The principal objectives of ground surveys would be to locate mines and large industrial buildings, to conduct geologic surveys, to make physical measurements useful in locating clandestine activities (such as seismic measurements to detect blasting), and to sample materials for radioactive elements.

In crowded, built-up areas, ground surveys will ordinarily pro-

vide a satisfactory and reasonably convenient means for determining the existence or nonexistence of operations which warrant direct inspection. Generally speaking, investigation by ground parties would be likely to pick up less irrelevant information than investigation by aerial surveys. Moreover, certain types of installations cannot be investigated adequately from the air. Examples range from underground structures and installations located in densely wooded areas to ordinary industrial buildings which may be detected with ease, but without reliable indication of the activities involved. Direct inspection may not be required if ground investigation discloses no basis for suspicion.

Ground surveys can be conducted with maximum efficiency if aerial surveys are available as an indication of the areas and installations which warrant attention, as well as the areas which can be ignored without appreciable risk.

The right to conduct ground surveys is essential, but should be subject to appropriate restrictions similar to those required for inspection.

7. *Safeguards against the dangers of clandestine mining would be provided by the right of inspection coupled with air and ground surveys based on adequate geological knowledge. Neither air survey nor ground survey alone provides adequate information; both are essential and they must be used in combination.*

All available geological knowledge, whether acquired directly or indirectly, is needed by the international control agency to determine the areas to which air and ground surveys should be directed for the detection of possible clandestine mining and milling. Aerial surveys of such areas, which should be provided for in accordance with Finding 5, will ordinarily reveal any unreported operation, or changes in a known installation, but will not usually indicate the character of the operations. Ground surveys may be required in areas not readily evaluated by aerial photography, e.g. heavily wooded areas or caves.

It is assumed that all declared mines producing uranium or thorium would be under controls designed to prevent the diversion of these materials. All other mines would have to be inspected at

appropriate intervals to make sure that they did not produce uranium or thorium as by-products, except where the geological formations exclude the possibility of uranium or thorium deposits.

In areas where the occurrence of uranium or thorium is known or probable on the basis of geological information, periodic aerial surveys could provide an adequate check on the existence of unreported mining operations. However, the character of these operations could only be determined by inspection at the mine and sampling of the ore and the products from the mine.

The detection of suspected clandestine mining operations might, on occasion, be facilitated by inspection of transportation facilities and materials being transported to or from areas known, or likely, to contain uranium or thorium deposits. In some cases the means of transportation required for unreported operations located in remote areas would provide an indication of the existence of activity of an unknown character. In cases involving transportation by water or by hydroplane, the usefulness of this method of detecting possible clandestine activities may be quite limited.

8. *Clandestine refineries and chemical and metallurgical plants may not differ from conventional chemical processing plants to a degree which would aid in their detection.*

Plants for the chemical and metallurgical treatment of uranium and thorium concentrates need not be so large as to attract attention. While the existence of these plants probably could be detected by aerial surveys if they were conducted, there would be little to indicate that they were engaged in clandestine operations. However, these plants alone would not constitute a serious threat, since their product would have to be fed into isotope separation plants or reactors which do have distinguishing characteristics.

9. *The detection of deliberately clandestine bomb manufacture as such is almost impossible; it is therefore vital that any unauthorized accumulation of essential nuclear fuels be prevented.*

Plant installations for the manufacture of bombs are small compared with those required for the production of nuclear fuels, and they have no distinguishing features to facilitate detection. As long as bomb design requires an unusual quality and variety of research personnel, the activities of such personnel might indicate

where bombs were being produced clandestinely; however, once the design of atomic weapons had been developed, the need for scientific personnel would be reduced and the value of a knowledge of the activities of key personnel would therefore be slight. Because of the difficulties in detecting clandestine bomb manufacture and because of the extremely short time and small facilities required to produce the bomb if the necessary fissionable material is available, it is essential that stringent safeguards be taken at earlier stages. Accordingly, the prevention of clandestine bomb manufacture must begin with the establishment of safeguards against diversion and clandestine production of raw materials and must be applied at all stages in the production and use of fissionable material.

Summary

A. The international control agency will require broad privileges of movement and inspection, including the rights to conduct surveys by ground and air. These privileges should, however, be very carefully defined to insure against misuse.
B. Reports and returns on relevant matters will be required from national governments.
C. The international control agency should coordinate all relevant information to determine what areas may be suspected of containing clandestine activities.
D. Isotope separation plants, reactors, and chemical extraction plants, as well as mines, have distinguishing features which would facilitate the detection of clandestine activities at those stages.
E. Detection of clandestine refineries and chemical and metallurgical plants is more difficult than detection of clandestine operations at other stages in the processing of nuclear fuel.
F. The detection of clandestine bomb manufacture as such is almost impossible; it is therefore vital that any unauthorized accumulation of essential nuclear fuels be prevented.

CHAPTER 7—SAFEGUARDS AGAINST THE SEIZURE OF ATOMIC ENERGY ESTABLISHMENTS OR MATERIALS

Seizure means the overt removal of declared peaceful activities from the exercise of effective authority by the international con-

trol agency. The seriousness of seizure of atomic plants and materials would depend on the stage in the production of nuclear fuels at which seizure occurred. The relative dangers of the material at various stages have been considered and are set forth in the earlier findings. The problem of erecting safeguards against the dangers from seizure is before the Commission, but has not yet been given more than preliminary consideration. However, it is possible at this time to indicate the scope of the problem and some of the considerations involved.

The agreed finding of the Scientific and Technical Committee in this connection, as stated in its report, is: "We have been discussing the possibilities of clandestine diversion of materials from the peaceful activities in the domain of atomic energy, but we must not overlook that with certain systems of control one would have to consider the possibility that plants or materials might be seized. This implies a danger, the seriousness of which would be greatest in the case of seizure of stocks of concentrated nuclear fuel, because from that stage weapons could be produced most quickly and in relatively small plants. Next in order of seriousness would be the seizure of plants producing nuclear fuels. A wide geographical dispersal of stocks and plants and the restriction of stocks to minimum operating levels would reduce the risk that a large quantity would be involved in a single seizure. Seizure of mines or of facilities at other early stages would only be of advantage to those desiring to make weapons if they had at their disposal a plant capable of producing nuclear fuel."

Political and general considerations are paramount in the matter of safeguards against seizure. No technical measures are likely to prevent seizure by a nation that has determined upon aggression and such measures as could be administered by an international control agency could hardly give complete satisfaction from the point of view of safety. There may, however, be some measures of a technical nature which could be applied through an international control agency; these measures would assist in forestalling seizure and would tend to minimize the military advantages that an aggressor could expect from seizure.

The nature of the evidence reviewed by the Commission to date

suggests that its further deliberations on the subject of seizure should include consideration of the following topics:

1. Seizure as it applies to materials and plants under different types of safeguards.

2. The desirability of the geographical dispersal of plants and stocks of materials.

3. The possibility of the reduction of inventories of materials in process or in storage.

4. The possibility of making the materials for power unsuitable for weapons.

5. The desirability of providing for the damaging or destruction of plants before they can be seized.

Summary

Problems relating to seizure have been considered thus far only in preliminary terms. The major questions of seizure are political rather than technical. It appears, however, that technical measures could reduce the military advantages and therefore the dangers of seizure.

CHAPTER 8—COORDINATION SAFEGUARDS

Introduction

The preceding chapters of this report have discussed the safeguards required at each stage in the production and use of atomic energy to prevent the dangers indicated in the report of the Scientific and Technical Committee. In designing an effective and comprehensive system of control, attention must be given not only to the safeguards required at the several stages but also to the interrelation among those safeguards. Of particular importance in this connection is the scheduling of operations at successive stages in such a way that stocks of dangerous material are kept to a minimum.

The coordination of safeguards raises further important questions as to the nature, organization, and powers of the international control agency responsible for the control of atomic energy. Preliminary investigations have indicated that, when considering the

powers of the international control agency, further attention will have to be given to the interrelations among controls at various plants and the degree of control over uranium and thorium through all of the processes. These subjects have not as yet been considered by the Committee.

Findings

1. *In addition to material accounting at each individual step in atomic energy processes, the international control agency should provide for material accounting checks between points of shipment and receipt of material as a means of detecting possible diversion in transit.*
2. *The international control agency should control the storage and shipment of uranium and thorium materials to the degree necessary for security purposes.*
3. *The international control agency should itself store and itself handle all enriched or pure nuclear fuel in transit. This does not necessarily imply ownership either of the materials or of the transit or storage facilities, questions which have not yet been discussed.*
4. *Since stocks of concentrated or pure nuclear fuel are acutely dangerous, operations at successive stages in the production of atomic energy should be so scheduled that stocks of materials in transit and in storage are minimized, but without interfering unduly with the development and effectiveness of peaceful activities.*

TEXT OF THE GENERAL ASSEMBLY RESOLUTION OF 14 DECEMBER 1946

Principles Governing the General Regulation and Reduction of Armaments

1. In pursuance of Article 11 of the Charter and with a view to strengthening international peace and security in conformity with the Purposes and Principles of the United Nations,

The General Assembly,

Recognizes the necessity of an early general regulation and reduction of armaments and armed forces.

2. Accordingly,

The General Assembly,

Recommends that the Security Council give prompt consideration to formulating the practical measures, according to their priority, which are essential to provide for the general regulation and reduction of armaments and armed forces and to assure that such regulation and reduction of armaments and armed forces will be generally observed by all participants and not unilaterally by only some of the participants. The plans formulated by the Security Council shall be submitted by the Secretary-General to the Members of the United Nations for consideration at a special session of the General Assembly. The treaties or conventions approved by the General Assembly shall be submitted to the signatory States for ratification in accordance with Article 26 of the Charter.

3. As an essential step toward the urgent objective of prohibiting and eliminating from national armaments atomic and all other major weapons adaptable now and in the future to mass destruction, and the early establishment of international control of atomic energy and other modern scientific discoveries and technical developments to insure their use only for peaceful purposes,

The General Assembly,

Urges the expeditious fulfilment by the Atomic Energy Commission of its terms of reference as set forth in Section 5 of the General Assembly Resolution of 24 January 1946.

4. In order to insure that the general prohibition, regulation and

reduction of armaments are directed toward the major weapons of modern warfare and not merely toward the minor weapons,

THE GENERAL ASSEMBLY,

RECOMMENDS that the Security Council expedite consideration of the reports which the Atomic Energy Commission will make to the Security Council and that it facilitate the work of that Commission, and also that the Security Council expedite consideration of a draft convention or conventions for the creation of an international system of control and inspection, these conventions to include the prohibition of atomic and all other major weapons adaptable now and in the future to mass destruction and the control of atomic energy to the extent necessary to insure its use only for peaceful purposes.

5. THE GENERAL ASSEMBLY,

FURTHER RECOGNIZES that essential to the general regulation and reduction of armaments and armed forces is the provision of practical and effective safeguards by way of inspection and other means to protect complying States against the hazards of violations and evasions.

Accordingly,

THE GENERAL ASSEMBLY,

RECOMMENDS to the Security Council that it give prompt consideration to the working out of proposals to provide such practical and effective safeguards in connection with the control of atomic energy and the general regulation and reduction of armaments.

6. To insure the adoption of measures for the early general regulation and reduction of armaments and armed forces, for the prohibition of the use of atomic energy for military purposes and the elimination from national armaments of atomic and all other major weapons adaptable now or in the future to mass destruction, and for the control of atomic energy to the extent necessary to insure its use only for peaceful purposes,

THERE SHALL BE ESTABLISHED,

Within the framework of the Security Council, which bears the primary responsibility for the maintenance of international peace and security, an international system, as mentioned in paragraph 4, operating through special organs, which organs shall derive

their powers and status from the convention or conventions under which they are established.

7. THE GENERAL ASSEMBLY,

regarding the problem of security as closely connected with that of disarmament,

RECOMMENDS the Security Council to accelerate as much as possible the placing at its disposal of the armed forces mentioned in Article 43 of the Charter;

IT RECOMMENDS the Members to undertake the progressive and balanced withdrawal, taking account of the needs of occupation, of their armed forces stationed in ex-enemy territories, and the withdrawal without delay of armed forces stationed in the territories of Members without their consent freely and publicly expressed in treaties or agreements consistent with the Charter and not contradicting international agreements;

IT FURTHER RECOMMENDS a corresponding reduction of national armed forces, and a general progressive and balanced reduction of national armed forces.

8. Nothing herein contained shall alter or limit the resolution of the General Assembly passed on 24 January 1946, creating the Atomic Energy Commission.

9. THE GENERAL ASSEMBLY,

CALLS upon all Members of the United Nations to render every possible assistance to the Security Council and the Atomic Energy Commission in order to promote the establishment and maintenance of international peace and collective security with the least diversion for armaments of the world's human and economic resources.

AMENDMENTS TO THE TEXT OF PARTS II AND III OF THE "FIRST REPORT OF THE ATOMIC ENERGY COMMISSION" PROPOSED BY MR. GROMYKO, FEBRUARY 18, 1947

ON PART II, ITEM C—"GENERAL FINDINGS"

1. Add the following paragraph to Item 2:

"Inspection, supervision and management on the part of an international organ shall be applied in regard to all existing plants for the production of ultimate atomic materials (nuclear fuel) immediately after the entry into force of an appropriate convention or conventions."

2. Change the wording of the first paragraph of Item 5, this paragraph to read as follows:

"5. That an effective system of control of atomic energy must be international in scope and must be established by an enforceable multilateral convention which must be administered within the framework of the Security Council."

3. Change the wording of paragraph 6 to read as follows:

"6. That an international convention outlawing the production, possession and use of atomic weapons is an essential part of any such system of international control of atomic energy. To be effective, such a convention must provide for the establishment of a comprehensive system of international control including supervision and inspection to insure the carrying out of the terms of the convention and 'to protect complying States against the hazards of violations and evasions.' (Quotation is from the Commission's terms of reference as set forth in Article V of the Resolution adopted by the General Assembly on 24 January 1946.)"

ON PART III—"RECOMMENDATIONS"

4. Add to paragraph 1 after the words "in the Commission's Terms of Reference" the following phrase: "and in the General Assembly Resolution of 14 December 1946 on 'Principles Governing the General Regulation and Reduction of Armaments.' "

5. Change the wording of paragraph 2 to read as follows:

"Such a system of international control of atomic energy should be established and its scope and functions defined by a convention in which all of the nations Members of the United Nations should be entitled to participate with the same rights and obligations. The international system of control should be declared operative only when those Members of the United Nations necessary to assure its success by signing and ratifying the convention have bound themselves to accept and support it. Consideration should be given to the matter of participation of non-Members of the United Nations."

6. Make the following alterations in paragraph 3:

In place of the introductory sentence: "The treaty or convention should include, among others, provisions" substitute the following sentence: "The convention should include, among others, provisions."

Paragraph 3 (a) to read as follows:

"Establishing within the framework of the Security Council, an International Control Commission possessing powers and charged with responsibility, necessary for the effective implementation of the terms of the convention and for the prompt discharge of its day-to-day duties. Its rights, powers and responsibilities should be clearly established and defined by the convention. Such powers should be sufficiently broad and flexible to enable the Commission to deal with the situation that may arise in the field of atomic energy in connection with new discoveries. In particular, the Commission shall assist in every way in promoting among all nations the exchange of basic scientific information on the use of atomic energy for peaceful purposes, shall be responsible for preventing the use of atomic energy for military purposes and for stimulating its uses for the benefit of the peoples of all countries. The control organs and the organs of inspection should carry out their control and inspection functions, acting on the basis of their own rules, which should provide for the adoption of decisions, in appropriate cases, by a majority 'vote.' "

7. Paragraph 3 (c) to read as follows:

"Prohibiting the manufacture, possession and use of atomic weapons by all nations parties to the convention or conventions and by all of their nationals."

8. Paragraph 3 (d) to read as follows:

"Providing for the destruction of stocks of manufactured atomic weapons and of unfinished atomic weapons."

9. Paragraph 3 (e) to read as follows:

"Specifying the means and methods of determining violations of the terms of the convention, condemming such violations as international crimes, and establishing the nature of the measures of enforcement and punishment to be imposed upon persons and upon nations guilty of violating its provisions.

"The judicial or other processes for determination of violations of the convention and of punishment therefor, should be swift and certain. Serious violations of the convention shall be reported immediately by the Commission to the nations parties to the Convention, and to the Security Council."

10. Paragraph 4 to read as follows:

"In consideration of the problem of violation of the terms of the convention, it should be borne in mind that a violation might be of so grave a character as to give rise to the inherent right of self-defense recognized in Article 51 of the Charter of the United Nations."

11. Change the wording of paragraph 5 to read as follows:

"5. The convention should embrace the entire program for putting the system of international control of atomic energy into effect and should provide a schedule for the completion of the transitional process, after the expiration of a certain period of time, step by step in an orderly and agreed sequence leading to the full and effective establishmment of international control of atomic energy. In order that the transition may be accomplished as rapidly as possible and with safety and equity to all, this Commission should supervise the transitional process as prescribed in the convention and should be empowered to determine when a particular stage or stages may be considered to have been completed and subsequent ones are to commence."

12. It is proposed to add a paragraph 6 to read as follows:

"With a view to the earliest possible implementation of the findings and recommendations stated above, and also of the General Assembly Resolution of 14 December 1946 on 'Principles Governing the General Regulation and Reduction of Armaments,' the Security Council recognizes the urgency of considering draft conventions on the prohibition of atomic and other major weapons adaptable to mass destruction."

RESOLUTION UNANIMOUSLY ADOPTED BY THE SECURITY COUNCIL ON MARCH 10, 1947

The Security Council, having received and considered the First Report of the Atomic Energy Commission dated 31 December 1946, together with its letter of transmittal of the same date,

RECOGNIZES that any agreement expressed by the Members of the Council to the separate portions of the Report is preliminary since final acceptance of any part by any nation is conditioned upon its acceptance of all parts of the control plan in its final form;

TRANSMITS the record of its consideration of the First Report of the Atomic Energy Commission to the Commission;

URGES the Atomic Energy Commission, in accordance with the General Assembly Resolutions of 24 January and 14 December 1946, to continue its inquiry into all phases of the problem of the international control of atomic energy and to develop as promptly as possible the specific proposals called for by Section 5 of the General Assembly Resolution of 24 January 1946, and by the resolution of the General Assembly of 14 December 1946, and in due course to prepare and submit to the Security Council a draft treaty or treaties or convention or conventions incorporating its ultimate proposals;

REQUESTS the Atomic Energy Commission to submit a Second Report to the Security Council before the next session of the General Assembly.

STATEMENTS

STATEMENT BY BERNARD M. BARUCH TO THE WORKING COMMITTEE OF THE ATOMIC ENERGY COMMISSION, 27 DECEMBER 1946

Mr. Chairman, having been identified with the question of veto, I think I should make plain to my colleagues just what the United States' position is.

I fear that in spite of many explanations, the position of the United States representative on this Commission with respect to what is generally referred to as the Security Council veto is still not clearly understood. We have not attacked the Security Council veto as provided in the Charter, we do not intend to attack it. If it were in my power to modify it, I would not even suggest that it be modified at this time.

A sharp distinction exists—and it has been made in the United States proposals—between (1) the principle of unanimity of action as applied to general problems or to particular situations not foreseeable and therefore not susceptible to advance unanimous specific agreement; and (2) the voluntary relinquishment of the so-called secondary or continuing right of veto on questions relating to a specific program previously approved by the Security Council and established by an effective treaty among the nations. As to (1) above, we suggest no change in the present procedures of the Security Council; as to (2) above, we maintain that no veto can be allowed to apply.

The American proposal in no way violates the principle of the unanimity of the Great Powers or the application of the veto as conceived in the Charter. It is at variance only with an extreme and attenuated and, I am sure, unintended use of the veto.

The so-called veto problem in this instance has four facets:

First: When our recommendations have been delivered to the Security Council the doctrine of unanimity of the Great Powers is applicable. I repeat—When our recommendations have been delivered to the Security Council the doctrine of unanimity of the Great Powers is applicable. Unless our proposals, or some modification of them that the Security Council may make, are acceptable

to all of the great powers, they will die aborning. We have not attacked this sound, proper and intended exercise of the doctrine of unanimity.

Second: After the Security Council has approved a proposed plan and a treaty has been prepared, all nations, not only the great powers, have the right to exercise their discretion or a veto as to whether or not they decide to become parties to the system of international control. Here again is a veto to which we raise no objection.

Third: When the body to administer the international control system has been set up, it will presumably receive powers adequate for the effective performance of its task. We have, I think, all agreed that the doctrine of unanimity should not be applicable to the operation of the administrative body.

Fourth: If, contrary to its solemn agreements, a nation in violation of the terms of the treaty seizes a plant or some fissionable material or commits some other major breach, shall the administrative body be obliged to bring this to the attention of the nations and to the attention of the Security Council? By prior action and by the very doctrine of unanimity itself, both the Security Council in approving the system, and the nations in signing the treaty, will have accepted the responsibility to observe and to enforce the obligations of the treaty. It is at this point that we maintain that a violator should not have a veto to protect him against the consequences of his willful wrongdoing.

Our people believe that the United Nations stands for the sanctity of treaties and for the keeping of the pledged word in international relations. If our people were to believe that it lay within the power of a violator of treaties voluntarily entered into under the United Nations legally to escape the consequences of violation of such treaties, in my opinion, they would—and they should—withdraw their support from this organization, which, in these circumstances, can be no more than a debating society and a place to exchange pious-sounding documents.

The United States proposals are entirely consistent with this position and with the letter and spirit of the United Nations

Charter. They are, so far as I can see, the only possible position that can be taken within the letter and the language of the Charter. Any other course would shock the moral, common sense judgment of the world. Unless this is so, every international treaty from this time on will be meaningless, in that it contains by implication a clause to the effect that any major power to such a treaty—or any minor power that finds a friend among the major powers—is not legally bound to carry out a treaty to which it has voluntarily affixed its signature and solemnly bound itself—if and when it decides to ignore it.

If the violators of a treaty can legally and with impunity escape the consequences of a violation of an agreement voluntarily entered into, then every treaty executed under the auspices of the United Nations contains the fatal defect that it is binding only so long as the major nations want it to be binding.

The issue at stake here is sanctity of a treaty versus the sanctity of the veto. I do not see why a nation which intends to keep the treaty should want the veto. Only those nations which may intend to violate the treaty would want the protection of the veto.

It has been said that if a great nation decides to violate a treaty, no agreements, however solemn, will prevent such violation; that if a great nation does not have the right to release itself from its obligations by veto the result will be war. I agree. I believe that a clear realization of this would be the greatest step toward peace that had ever been taken in history. Let all nations that willingly set their pens to the terms of this treaty realize that its willful breach means punishment and, if necessary, war. Then we will not lightly have breaches and evasions. This goes to the very essence of the United Nations. It is the spirit of the preamble and the purposes of the Charter—"to take effective collective measures for the prevention and removal of threats to the peace."

I cannot recommend to the people of the United States, I cannot advocate before the Senate of the United States, that this country surrender this potent weapon and dedicate to mankind its tremendous knowledge in the field of the production of atomic energy—in the belief that they are outlawing the use of this

weapon for war and opening the gates for the use of atomic energy for the good of all mankind—under any system which is open to nullification of punishment by what can be called a subterfuge.

All that we have asked you to do is to vote in favor of the proposition that it should not lie within the power of anyone to determine by his own veto whether he or a friend is guilty and should be punished.

Gentlemen, it is either—or. Either you agree that a criminal should have this right by voting against our position (or you fail to take a stand on the question by refraining from voting), or you vote for this sound and basic principle of enduring justice and plain common sense.

STATEMENT BY GENERAL McNAUGHTON IN THE ATOMIC ENERGY COMMISSION, DECEMBER 30, 1946

Mr. Chairman, the proposal of the distinguished representative of the United States to make the consideration of this report, that is Document AEC–18, dated 28 December 1946, the matter of substance which is before this meeting, carries the judgment of the Canadian Delegation. Our attitude in relation to this report can be stated very simply: In our view, its main purpose is to record the large measure of agreement reached in the Commission on the fundamental principles involved in the international control of atomic energy and on the methods by which this can be achieved. To attain this objective, we have felt that everything possible should be done to insure that the report be clear, precise, and unambiguous in word and in meaning. We have also felt that it should be consistent not only within itself, but also with the important international agreements which govern our work: The Charter of the United Nations and the resolutions of the General Assembly of January 24, and of December 14, of this year.

We have also been concerned that there should be sufficient opportunity for adequate discussion of all the proposals included in this report, and it was with these purposes in view that I submitted the amendment to the resolution of the United States delegation which was accepted by our meeting on December 20. In the Working Committee, we have had full opportunity to discuss, consider, and revise the proposals of the United States delegation of December 5, item by item, in the same manner as other parts of the report. We have, in fact, made many changes. If there are delegations which have not taken advantage of these opportunities, that is their misfortune, and ours too. But this should not, however, prevent us from coming to a decision now as we have previously agreed to do, by the thirty-first of December, that is, tomorrow.

Having in mind the importance of the matters that are before us, we have held that no conclusion should be adopted or rejected without the most careful consideration of every aspect. It is important, of course, that we work swiftly. It is even more important

that we work well, and we have had, I think, ample opportunity for discussion of our report. I remind you that this is an interim report. It records the agreements which we have reached on the scientific and technical aspects of the problem, and it gives some, at least, of the safeguards which must be provided to insure that atomic energy should not be turned to destructive uses, but should be employed for the benefit of mankind.

The report also contains findings and conclusions of a political character, and these include the three paragraphs referred to in the Chairman's covering letter. It seems evident from the discussion which has taken place, that these paragraphs represent the greatest measure of agreement that can be secured on these matters at this time, and therefore, the Canadian delegation accepts these paragraphs for inclusion in the report.

In this connection, let there be no misunderstanding as to the position of the Canadian delegation on the matter of the veto, which has caused such controversy, perhaps unnecessarily, in this Commission. It was not because of any liking for the veto that we questioned at an earlier stage the desirability of including a reference to it in this interim report. The Canadian delegation represents a government which has never disguised its doubt about the exercise of the power of veto in relation to international decisions. It was merely that we thought such a reference to the veto was premature, that it would carry our discussion beyond the area of possible common agreement at this time, and thus might prejudice the prospects of acceptance of this, our first report, not only in this Commission, but also in the Security Council. We must not forget that all we are doing is to report to the Security Council itself, a fact which I think removes most of the force of objections raised by the representative of the Soviet Union. However, as matters stand, the Canadian delegation feels that the present text is the one which will command the greatest measure of agreement, and for these reasons, Mr. Chairman, the Canadian delegation will vote for the report as it now stands.

EXTRACTS FROM THE STATEMENT BY MR. GROMYKO IN THE SECURITY COUNCIL ON 14 FEBRUARY 1947

The past work of the Atomic Energy Commission has been useful in the sense that it has made it possible to clarify the attitude of individual States on this question. Unfortunately, however, it must be stated that the Commission has not been so far in a position to reach an agreement on recommendations concerning atomic energy control and to submit the agreed proposals to the Security Council for its approval. The report of the Atomic Energy Commission submitted to us for consideration is not a document containing such agreed recommendations. This can be explained only by the fact that the findings and recommendations, contained in the report, are not in conformity with the decision of the General Assembly of December 14, 1946, on principles governing the general regulation and reduction of armaments and armed forces, and in some respects they are not in conformity with the United Nations Charter.

The Atomic Energy Commission could have arrived at a unanimous decision only on the basis of the principles embodied in the United Nations Charter, and likewise on the basis of the decision of the General Assembly mentioned above. Unfortunately, the results of the past work of the Commission show that this absolutely necessary condition has not been properly observed. The proposals submitted for the consideration of the Commission by the representative of the United States of America and then included in the report submitted to us, in their most important parts are in conformity neither with the resolution of the General Assembly nor with the United Nations Charter.

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In the General Assembly decision of December 14, the prohibition and elimination from national armaments of atomic and other kinds of weapons adaptable to mass destruction, are recognized as an urgent aim. In paragraph 4 of the General Assembly

resolution it is stated that "The Security Council" should "expedite consideration of a draft Convention or Conventions for the creation of an international system of control and inspection, these Conventions to include the prohibition of atomic and all other major weapons adaptable now and in the future to mass destruction, and the control of atomic energy to the extent necessary to insure its use for peaceful purposes only."

In the light of the General Assembly decision the conclusion of a Convention prohibiting atomic weapons becomes an urgent task. It was precisely for this reason that the representative of the Soviet Union to the Atomic Energy Commission in his statement of December 30, 1946, again raised the question of the necessity of the solution of the question of the prohibition of atomic and other major weapons adaptable to mass destruction, and of a prompt conclusion of an appropriate Convention for this purpose.

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The conclusion of a Convention on the prohibition of atomic weapons would be one of the most important and urgent measures for the prevention of the use of atomic energy for military purposes and for insuring its use only for the benefit of humanity. Being carried out, this measure, in its turn, would facilitate the working out of further measures on the control of atomic energy and of a system of other measures in this field, provided for in the General Assembly resolution of December 14, 1946.

The conclusion of a Convention prohibiting atomic weapons should not stop the working out of a comprehensive system of measures on atomic energy control, working out the questions of inspection and other questions in connection with the solution of the tasks set forth by the General Assembly in this field. Work on these questions can and should continue until all these measures are worked out and until a still more comprehensive system of measures, insuring the fulfilment of the tasks, resulting from the General Assembly decision, is created. However, the working out of a comprehensive system of measures for the control of atomic energy will inevitably take time, even if the work progresses relatively smoothly. Therefore, it would be wrong to

postpone the solution of the question of the conclusion of a Convention on the prohibition of atomic and all other major weapons, adaptable to mass destruction, until a system of control is worked out in detail. To put the question in this way means to delay the fulfilment of the General Assembly resolution of December 14, 1946, providing for a prompt solution of the question of the prohibition of atomic weapons.

I have already pointed out that at the present time atomic energy is still being used for the production of atomic weapons. Such a situation in itself is inconsistent with the tasks set forth in the General Assembly resolution. It is inconsistent with the spirit of the General Assembly decision, providing, among the measures to be carried out, the urgent prohibition of atomic weapons. Meanwhile there are some people who see nothing unusual in the fact that simultaneously with the discussion of the measures for the general reduction of armaments and armed forces and for the prohibition of atomic weapons the unhampered production of these weapons is taking place. Moreover, they sometimes try to prove to us that the continuation of the production of such weapons is almost an indication of peace-loving intentions and almost represents in itself the very thing that is required of the States Members of the United Nations by the decision of the General Assembly.

It is true, there are also such people who point out bluntly that they do not care whether the continuation of the production of atomic weapons corresponds to the sense and spirit of the decision of the United Nations organization or not, nevertheless the production of these weapons should be continued until the American proposals on the control of atomic energy are fully accepted. In other words, the continuation of the production of atomic weapons is used as a certain kind of a lever for political pressure on some other nations. It is time to tell these people that similar attempts cannot bring the results desirable for them. At the same time such attempts are capable of seriously damaging the entire cause of the fulfilment of the General Assembly decision.

If all of us wish to proceed in earnest with the fulfilment of the General Assembly decision, then it is necessary to state clearly

and distinctly that there is no excuse for the delay of the conclusion of a Convention on the prohibition of atomic weapons. The Soviet Government deems it necessary to point this out as well in the Security Council, which has to determine its attitude toward the report of the Atomic Energy Commission, submitted to the Council for its consideration.

The United States proposals laid down as a basis for the submitted report have a number of other serious defects. During the discussion of the draft report of the Atomic Energy Commission I already pointed out in my statement at the meeting of the Commission on December 30, 1946, that according to the proposals of the United States representative on the Commission, international control of atomic energy is to be established "within the framework of the United Nations," while the General Assembly decision definitely states that the international system of atomic energy control is provided "within the framework of the Security Council." The fact that, in spite of the obvious nonconformity between the American proposals and the General Assembly decision on this question, the representatives of the United States insist upon their proposal, probably, is not incidental. It means that somebody has certain plans, which are not in conformity with the decision adopted by the General Assembly.

I wish to draw the attention of the Security Council to the fact that while considering this question at the General Assembly, none of the delegations objected to the appropriate item in the resolution, including the delegation of the United States. Everybody agreed then, that an effective international system of measures on the control of atomic energy was possible within the framework of that organ of the United Nations which is charged with the main task of the maintenance of peace and international security. Such an organ is the Security Council possessing the appropriate powers and acting on behalf of all the Member-States of the United Nations.

In the American proposals, included in the report of the Atomic Energy Commission, there are some other items, which are not in conformity with the decision of the General Assembly. I shall dwell upon them in detail in the course of the discussion of the

conclusions and recommendations on the items contained in the report.

The report of the Atomic Energy Commission, as I have already pointed out, contains recommendations which are not only in contradiction with the General Assembly decision of December 14, 1946, but are in contradiction with the basic principles of the United Nations. On one hand, these recommendations provide for the creation of "an international authority" with broad rights and powers, up to granting to it the rights to possess and manage the plants connected with the production of atomic energy, though this authority is not granted real possibilities to exercise these powers. On the other hand, these recommendations undermine the foundation of the effective activities of the Security Council, in the framework of which an international system of control of atomic energy should be established, since they provide that the principle of unanimity of the five great powers in the Security Council should not be applied while taking decisions on sanctions in cases when violation of the control system is determined.

It is impossible to reconcile the recommendation, proposed in the report on this question, with Article 27 of the United Nations Charter in which the principle of unanimity of the five powers-permanent members of the Security Council has been formulated. As is well known, this Article of the Charter provides that the Security Council should take decisions on sanctions, as well as other important decisions under the condition of the unanimity of the five powers-permanent members of the Security Council. What is proposed by the recommendations contained in the report of the Atomic Energy Commission, is actually a departure from the principle of unanimity of the five powers in the Security Council and leads to undermining the foundations not only of effective activities of the United Nations organization, in particular of the Security Council, but also the foundations of the very existence of this Organization as an instrument in the struggle for peace and international security, and therefore they cannot constitute a basis for an agreement and must be rejected.

Besides, such proposals are vicious because they sow seeds of suspicion toward the great powers and among them instead of

strengthening mutual confidence among the States as well as the confidence in respect to the great powers. Indeed, is not it clear that the adoption of the proposal of the United States representative, providing for the retreat from the principle of unanimity of the five powers in the Security Council, would mean that from the very beginning of the establishment of atomic energy control we would proceed from the assumption that the great powers first of all might be violators of the control? Do proposals of such a kind correspond to the spirit of cooperation among the great powers which is necessary for the maintainance of peace?

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We are told that the retreat from the principle of unanimity in the Security Council while taking decisions on sanctions by the Security Council in cases of detection of violations of the established control, is necessary in order to punish those who are guilty of such violations. The thesis on the necessity of punishing violators of control is undoubtedly correct. Is there any difference of opinions on this question? I have not heard anyone who would object to the proposals and to the demands for punishment of violators of the control system. Consequently, it is not a question that the American proposals provide for punishment of violators, and as if other proposals did not provide for such measures. In reality the question is—whether the decisions taken by the Security Council on sanctions against the violators of the control should be adopted in accordance with the United Nations Charter or in violation of the Charter. The question is whether such decisions should be taken on the basis of the principles laid down as a foundation of the activities and existence of the United Nations, or in violation of these principles.

The statements that the principle of unanimity, as such, may become an obstacle preventing the adoption of measures by the Council against the violators of the control are absolutely groundless. They are obviously calculated on the fact that there are still some naive people capable of believing in such a kind of a more than strange argumentation.

The interests of the maintainance of peace require that all the

necessary effective measures be taken to this end against the violators of the Convention on the prohibition of atomic and all other major weapons, adaptable to mass destruction, and against the violators of the established system of control.

The violators should not be left unpunished. With this purpose the Security Council must—and it has such a possibility—take effective measures against violators of an appropriate convention, up to applications of sanctions. The Security Council must take such measures in accordance with the Charter, which determines such procedure and the terms under which appropriate decisions should be taken on the carrying out of measures to remove the threat to peace or to restore peace in case of its violation.

This only correct and justified procedure by no means excludes the possibility that the body, which under the convention will be responsible for the practical application of measures of control, including inspection, will exercise the functions of control and inspection assigned to it, acting on the basis of its own rules, providing for the adoption of decisions, in appropriate cases, by the majority. The attitude of the Soviet Union on this issue was made clear during the last session of the General Assembly by the head of the Soviet Delegation, Foreign Minister of the U.S.S.R., V. M. Molotov.

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EXTRACTS FROM STATEMENT BY MR. GROMYKO IN THE SECURITY COUNCIL MARCH 5, 1947

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The position of the Soviet Union on the questions of the control of atomic energy and inspection is clear. Strict international control and inspection of atomic energy should be established. At the same time this strict international control and strict inspection should not develop into interference with those branches of industry which are not connected with the production of atomic energy. The international control of atomic energy should not deal with those questions which are not connected with atomic energy.

Logic tells us that any thought may be reduced to an absurdity. This applies even to good thoughts and ideas. The transformation of atomic energy control into an unlimited control would mean to reduce to an absurdity the very idea of control of atomic energy in order to prevent its use for military purposes. Unlimited control would mean an unlimited interference of the control and controlling organ—or organs—in the economic life of the countries on whose territories this control would be carried out, and interference in their internal affairs. This is not required of us by the fulfilment of the tasks set forth by the United Nations in the field of atomic energy control and prohibition of atomic weapons. This is not the task of the United Nations in connection with the establishment of the international control of atomic energy.

Such a conception of international control as is presented to us in the proposals of the United States, and which lies at the basis of the appropriate sections of the Report of the Atomic Energy Commission, may only complicate the entire matter of organizing the control and inspection, since, as I have already pointed out, it would mean a crude interference of the control organ in the internal affairs of States, in their economic life, which cannot be compatible with the basic principles of the United Nations. Such an interference in the internal affairs of States is not required by the interests of the effective control and does not

flow from the demands which are made on the control organs for the solution of the problems facing us in this field.

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The United States proposals on control proceed from the erroneous premise that the interests of other States should be removed to the background during the exercise by the control organ of its control and inspectorial functions. Only by proceeding from such fundamentally vicious premises, was it possible to come to the conclusion contained in the proposals submitted to the Atomic Energy Commission by the United States representative on the necessity of transferring atomic enterprises to the possession and ownership of the international organ which is to be charged with responsibility for the realization of control. A proposal of this sort shows that the authors of the so-called Baruch plan completely ignore national interests of other countries and proceed from the necessity of subordinating the interests of these countries to the interests actually of one country; that is, the United States of America.

It is easy to understand that the granting of such rights to control organs would mean a complete arbitrariness of these organs and, first of all, of those who would be in a position to command a majority in these organs. Granting such rights to control organs would give an easy opportunity for interference in the activities of the enterprises on the territory of one or another country, without any grounds for such interference.

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The tasks of the control organ which is entrusted with ownership, licensing and with a number of other functions are, as it were, identified with the tasks of international syndicates and trusts, the role and influence of which upon international relations and upon the economics of individual countries are well known. It was not for the creation of international syndicates and trusts, which would possess the establishments located on the territory of individual countries, that the Atomic Energy Commission was established. It was not for this that the General Assembly decided

on December 14, 1946, on the necessity of establishing atomic energy control and on prohibiting atomic weapons. It is time to understand that one cannot approach the solution of such questions guided only by the interests of one country; it is necessary to take into consideration the legitimate interests of other countries as well. One cannot imagine such a situation in which a control organ would possess establishments in different countries, decide the questions whether to allow or not to allow the creation of such establishments on the territories of these or other countries and would have the exclusive right to carry on scientific research in the field of the production and use of atomic energy. It is impossible to imagine such a situation. Only people who have lost the sense of reality can seriously believe in the possibility of creating such arrangements.

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Referring to the provision contained in the American proposals on the exclusive right of an international organ to carry on scientific research, [the British Association of] atomic scientists justly point out that "the danger does not come from research as such, but from the application of the results. The object of a control scheme is to insure that the result of such research would never be used for destructive purposes."

The idea of granting to the international control organ the right to possess establishments, to permit or not to permit this or that country to construct establishments, the right to possess the product of establishments, the exclusive right for scientific research, etc. contained in the proposals of the United States finds its reflection in the Report of the Atomic Energy Commission as well, though in a somewhat veiled form. In particular, such an idea was expressed in paragraph 4, Chapter 1, Part 5 of the Report. In this definition of the concept "management" there is formulated in essence the principle of handing over the establishments for the production of atomic energy to the possession of the control organ; that is, the principle which is stated in the most exact form in the above-mentioned statement of the representative of the United States on the Atomic Energy Commission.

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I draw attention especially to the fact that the Commission considers that management is the direct power and authority to take day-by-day decisions governing operations as well as responsibility for planning. These are plainly elements of the right of ownership.

I draw the attention of the Security Council also to the fact that, according to the finding contained in the Report, management is normally a prerogative of ownership. It is true that in the same part of the Report it is stated that management "need not imply ownership." However, these reservations, which apparently have been inserted to soften the main thesis, do not change the meaning of this paragraph and of the idea expressed in it, which is thoroughly vicious and unacceptable.

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I deem it necessary to emphasize that granting broad rights and powers of such a kind to the control organ is incompatible with the State sovereignty. Therefore, such proposals are unacceptable and must be rejected as unfounded. Not only do they not facilitate the solution of the problem of establishing strict and effective international control, but, on the contrary, they complicate the solution of this problem.

The thesis regarding the right of ownership or the right of dominion has nothing to do with the problems of the establishing of effective and real international control of atomic energy. This would seem to be obvious. Nevertheless, the above-mentioned proposals, in spite of their complete groundlessness, have been persistently advocated and defended. Various unconvincing arguments are cited to prove that allegedly only by granting such rights and powers to the control organ is it possible to establish a system of international control. Thorough acquaintance with the above-mentioned proposals shows that this thesis by references to control, only covers up a striving to obtain the right of interference in the economic life of countries as will be required by the interests, even of the majority of the control organ.

In speeches by representatives of some States in the Atomic Energy Commission and the Security Council, as well as in speeches

by numerous "experts," who appeared recently in great numbers, on the problems of international control of atomic energy, the question is very often asked: "How does the Soviet Union conceive the carrying out by the control organ of practical day-by-day activities, and how shall this organ take decisions relating to such day-by-day activities?"

The position of the Soviet Union on this question has already been stated more than once. If it is necessary, I am prepared to repeat that such an organ must have the right to take, in appropriate cases, decisions by majority vote. Does this mean, however, that it is possible by using references to international control, to agree in reality to granting the right of interference in the economic life of a country even through the decision of the majority in the control organ? The Soviet Union does not wish and cannot allow such a situation. The Soviet Union is aware that there will be a majority in the control organs which may take one-sided decisions, a majority on whose benevolent attitude toward the Soviet Union the Soviet people cannot count. Therefore the Soviet Union, and probably not only the Soviet Union, cannot allow that the fate of its national economy be handed over to this organ. The correctness of such a conclusion is confirmed by historical experience including the brief but very instructive experience of the activities of the United Nations organs. The Soviet delegation does not doubt that all those who objectively appraise the situation will correctly understand the position of the Soviet Union on this question.

Hence it follows that while creating an international organ of atomic energy and organizing inspection, it is necessary to have a strict regulation of rights and duties of the control organ, excluding arbitrariness and unlimited ranks. Such regulation cannot be an obstacle to the establishment of a strict and effective control, for carrying out strict and effective inspection. Rather on the contrary. Strictly defined rights and functions of a control organ will allow it to exercise more precisely and regularly its control and inspection functions. In such a situation there will be no place for interference of control organs in the economic life of a country.

Strict regulation of powers and duties of a control organ should

exclude the unlimited access for inspection purposes to all equipment and operations, access which is now provided for in the report of the Atomic Energy Commission, and should also exclude granting to inspection, the right to shut down plants to interfere with normal mining and milling operations and granting it the right of giving so-called licenses, that is, the permission to conduct definite activities on definite conditions, etc.

Regulation of the activities of the control organs will exclude similar actions, which are described in such detail in the so-called First Report on Safeguards, contained in the report of the Atomic Energy Commission. By the way, this Report on Safeguards is the least thoroughly thought out part of the Commission's Report. This can probably be explained partly by the fact that the proposals on safeguards have never been subjected by anyone to a more or less serious discussion in the Atomic Energy Commission. What is not included in this Report on Safeguards? What is not provided in it in connection with the definition of rights and the powers of the control organ? One can find in the Report the explanation of the necessity for travelling without restraint and for flights in and over territories of other countries at the inspectors' will; there can be found a description of the possibilities of a seizure by a group of people, of the establishments for the production of atomic energy.

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In reality, to grant to the control organ unlimited rights and possession and management of the atomic establishments, cannot be looked upon as anything but an attempt by the United States to secure for itself world monopoly in the field of atomic energy. This tendency has found its expression in the proposals submitted by the representative of the United States on the Atomic Energy Commission and later laid down as the basis of the report of the Atomic Energy Commission.

The one-sided nature of these proposals, which is aimed at securing the monopoly position of one country in the field of atomic energy, is being emphasized throughout the main proposals contained in the Report of the Atomic Energy Commission, throughout the recommendations, general findings, sections dealing

with the questions of safeguards and others. Should one, therefore, wonder that such proposals are often subjected to sharp and deserved criticism? In the above-mentioned statement of the British scientists, the proposal of the United States is criticized also from this aspect. The following is pointed out:

> The most important objection to the Baruch plan from the point of view of other nations is probably that it envisages in its first stages, measures which may be construed as maintaining the dominance of the United States in the field of atomic energy, whereas the concessions which are to be made by that country appear mostly in the later stages.

The scientists preferred to choose a somewhat restrained language for criticising these proposals. But still, in essence, they succeeded in noting a tendency to secure a monopoly position for one country by such proposals.

The adoption of such proposals, as well as the plan of the atomic energy control as a whole, submitted some time ago by the representative of the United States is in contradiction with the basic economic and national interests of other States, for this plan is directed against their economic independence. It is directed against the independence of other States. The situation is not altered by the fact that such a proposal even finds support.

EXTRACT FROM STATEMENT BY MR. AUSTIN IN THE SECURITY COUNCIL MARCH 10, 1947

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The objections of the Soviet Government to the Commission Report to the Security Council deal not only with the difficult question of the certainty of sanctions, not only with the difficult question of the sequence of steps by which international control may be established, not only with the reliance which may be placed on a purely conventional approach to the prohibition of atomic weapons. They deny the necessity, if security is to be achieved, for an international cooperative development in the field of atomic energy. They go to the very root of the problem. They attack the proposed International Agency on the ground that it would be a United States monopoly.

The United States takes the position that it is precisely the opposite.

What the majority seek is effective international control by a genuinely international cooperative development of atomic energy to which all nations would contribute their skills and their knowledge without secrecy, and in which all nations would share the benefits on an equitable basis.

Our purpose is to assure that each nation can safely realize these tremendous benefits for itself without danger to its national security or the security of its own economic and social system.

The alternative is a control which would be neither international nor effective—a control which would permit or encourage national rivalries. Because the United States believes that national rivalries would create secrecy, suspicion, and finally preparation for the horrors of atomic war, it has proposed to turn over in due course all its knowledge, its facilities, and its scientific skills to an international agency under necessary safeguards. Only when specific proposals have been presented, can the United States or any other nation assess the sacrifices which would have to be made in order to obtain the benefits of such an international agency. Specific proposals must be developed in the Atomic Energy Commission which was created for that purpose.

The United States does not desire to impose its will, in questions of atomic energy, on other countries. The Report itself proves the opposite. Ten countries united therein to forestall an atomic weapons race. The prohibition of atomic weapons in advance of a system of effective enforceable safeguards would not fulfil the mandate of the General Assembly adopted unanimously, or prevent an atomic weapons race.

My Government has made it clear that we welcome all constructive suggestions which might advance the solution of our common problem and fulfil the mandate of the General Assembly Resolution. The proposals put forward by the Soviet Government do not in our view contain constructive suggestions. While proclaiming themselves international, and while alleging a certain security against atomic warfare, they do not satisfy any of the conditions which are minimal and essential for such security. They do not provide for an international system of control of atomic energy at all. They provide for a system which at best would give no security, and at worst would be a constant incentive to distrust and war.

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INTERNATIONAL NOTES

February 19—March 17

Prepared by the Editorial Assistant, Division of Intercourse and Education

President Truman's Message to Congress

At a joint session of the Senate and the House of Representatives on March 12, President Truman asked the Congress to authorize aid to Greece and Turkey to the amount of $400,000,000 for the period ending June 30, 1948, and to authorize the dispatch to those countries of American civilian and military personnel to assist in the task of reconstruction and to supervise the use of such aid as may be given. The President said the British Government can no longer extend financial or economic aid to either Greece or Turkey and that the United Nations is not in a position to help in the situation, which is urgent and requires immediate action; that Greece's very existence is threatened by terrorist activities led by Communists and that Turkey's future as "an independent and economically sound State" is at stake; that the imposition of totalitarian regimes on the peoples of several countries recently has been the subject of protests by the United States[1] and that it must be "the policy of the United States to support peoples who are resisting attempted subjugation by armed minorities or by outside pressures." Mr. Truman said he was "fully aware of the broad implications involved if the United States extends assistance to Greece and Turkey," but that "creation of conditions in which we and other nations will be able to work out a way of life free from coercion" is "one of the primary objectives of the foreign policy of the United States" and was "a fundamental issue" in the late war in which victory was won "over countries which sought to impose their will, and their way of life, upon other nations." Pointing to the far-reaching effect of the failure of the United States to provide the aid asked, Mr. Truman said that should

1 Charges of Russian interference in the internal affairs of Hungary were made by the United States in two notes to the Soviet Union during the past fortnight. (For texts of notes and the Soviet reply to the first United States protest, see *New York Times*, Mar. 7, 12, and 18.)

Greece "fall under the control of an armed minority the effect upon Turkey would be immediate and serious," that "confusion and disorder might well spread throughout the entire Middle East," and the effect upon European countries "whose peoples are struggling to maintain their freedoms and independence" would be profound. (For text, see *New York Times* or New York *Herald Tribune*, Mar. 13.)

Moscow Meeting of Council of Foreign Ministers

The Foreign Ministers of the U.S.S.R., the United Kingdom, the United States, and France began consideration of treaties for Germany and Austria at Moscow on March 10. A Soviet proposal that the situation in China be discussed was opposed by the United States representative on the ground that China is not a participant in the talks, and a protest against adding this question to the Conference agenda was made by China also. Matters discussed thus far include the reduction of the occupation forces in Europe; demilitarization of German armed forces, which the Soviet representative claims has not been fully carried out in the western zones; and the progress of the denazification of the Germans. At their first session the Ministers formally approved the law for the liquidation of the State of Prussia which the Allied Control Council for Germany promulgated on February 20, and at their meeting on March 17 agreed upon evacuation of Allied troops from Austria within ninety days after the peace treaty with that country becomes effective.

Deputies of the Foreign Ministers who made some progress in the preparation of the treaty for Austria and discussed procedural matters relative to the German treaty in sessions at London from January 14 to February 2 are continuing their work at Moscow.

Anglo-French Treaty of Alliance

At Dunkirk, France, on March 4, the Foreign Ministers of Great Britain and France signed a fifty-year treaty which provides for common action by the two countries to prevent Germany from again becoming a menace to peace; that each will support and assist the other in the event of German aggression; and for

agreed action to deal with any situation arising from Germany's failure "to fulfil any obligation of an economic character imposed on her as a result of the instrument of surrender, or arising out of any subsequent settlement." The treaty contains also a pledge to "take all steps to promote the prosperity and economic security of both countries" to enable them "to contribute more effectively to the economic and social objectives of the United Nations." (For text, see *New York Times* or New York *Herald Tribune*, Mar. 5.)

British Government Statement on India

In a statement to the House of Commons on February 20, Prime Minister Clement Attlee announced the intention of the Government "to take the necessary steps to effect the transference of power into responsible Indian hands by a date not later than June, 1948." If the differences among the Indian parties which are now preventing the proper functioning of the Constituent Assembly shall not have been settled by that date, the British Government "will have to consider to whom the powers of the Central Government in British India should be handed over on the due date, whether as a whole to some form of Central Government for British India or in some areas to the existing provincial governments, or in such other way as may seem most reasonable and in the best interests of the Indian people." (For full text, see *New York Times* or New York *Herald Tribune*, Feb. 21.)

Prime Minister Attlee also announced the appointment of Rear Admiral Viscount Mountbatten to replace Viscount Wavell as Viceroy of India.

The Government's decision to end British rule in India by June of 1948 was approved by the House of Commons by a vote of 337 to 185 on March 6 following a two-day debate.

The Security Council of the United Nations

The Council's consideration of the interim report of the Atomic Energy Commission is fully reviewed in this pamphlet. The Council devoted a number of meetings to the Corfu mines case in which Great Britain claims that Albania was responsible for

the sowing of the mines which wrecked two British destroyers in the Corfu Channel last October. After statements from the British and Albanian representatives had been heard a special committee composed of representatives of Australia, Colombia, and Poland was named to sift the evidence. The subcommittee reported back to the Council on March 15 but failed to reach any decision in the case. Debate on the United States trusteeship proposals[2] for the former Japanese mandated islands begun on February 26 has thus far been inconclusive.

United States—Philippines Agreement

A ninety-nine-year agreement for United States military and naval bases in the Philippines was signed at Manila on March 14 by Manuel A. Roxas, President of the Philippines, and Paul V. McNutt, United States Ambassador. The agreement provides "that in the interest of international security any of the bases may be made available to the Security Council of the United Nations." In addition to the principal Army base at the Fort Stotsenberg military reservation, Pampanga Province, Central Luzon, and four operating areas for the Navy at Subic Bay, Sangley Point, Guiuan, and Tawi Tawi, ten other areas of limited size have been designated as bases. (See *New York Times*, Mar. 15; *Christian Science Monitor*, Mar. 17.)

2 For text, see Department of State *Bulletin*, Vol. XV, No. 385, November 17, 1946.

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